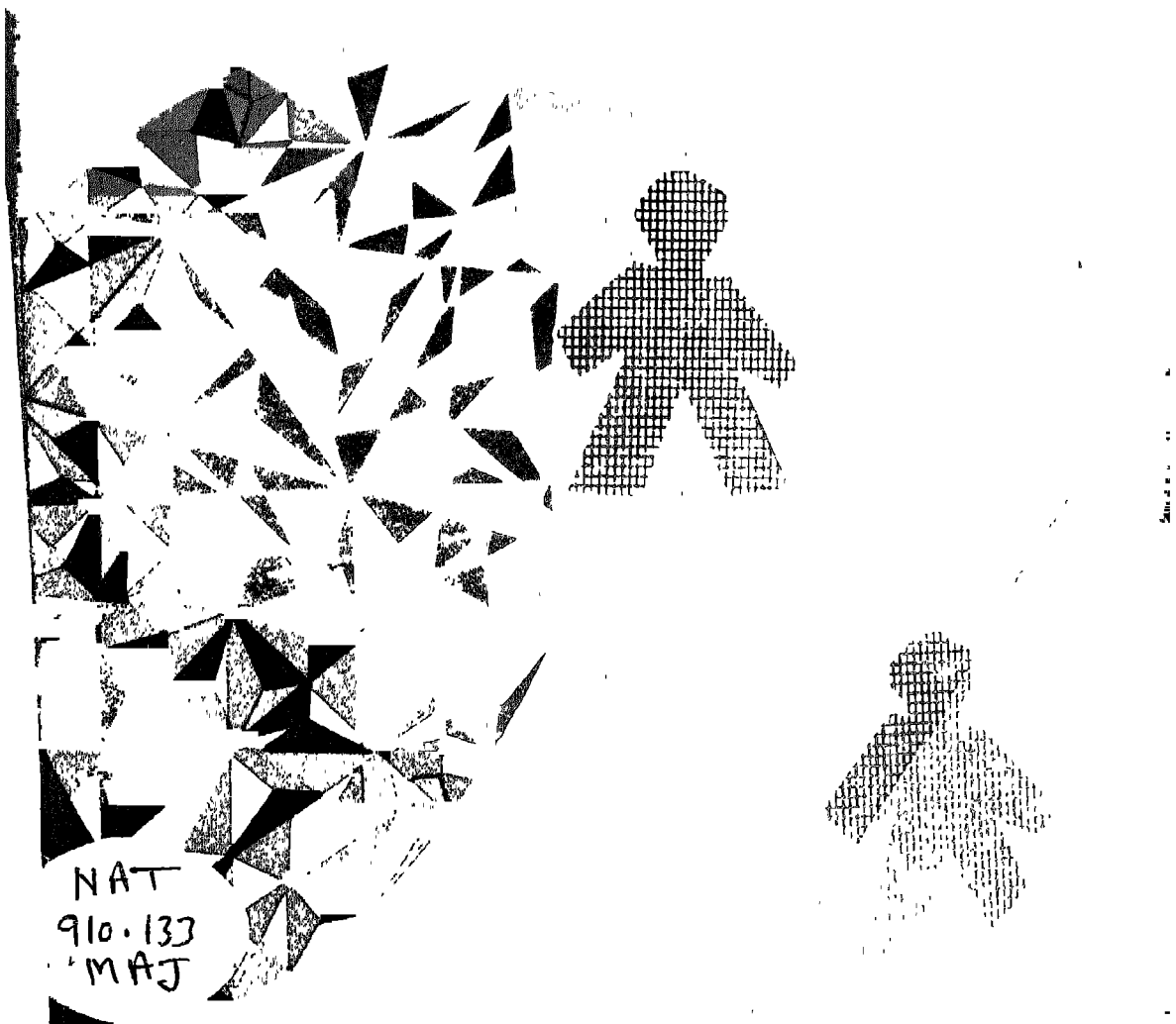


# HUMAN AND ECONOMIC

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# HUMAN AND ECONOMIC GEOGRAPHY

*A Textbook for Class XII*

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## Foreword

This book follows the approach taken by the Council in developing a curriculum for classes XI and XII.

An Editorial Board for geography for the secondary and higher secondary stage was constituted under the chairmanship of Prof. Moonis Raza. The Editorial Board devoted considerable time in developing the syllabi in geography for classes IX, X, XI and XII and then to the preparation of manuscripts of different books on the same.

The present volume "Human and Economic Geography" is one of the two textbooks meant for class XII.

Our thanks are due to Prof. Moonis Raza and his colleagues on the Editorial Board for preparing the syllabi and manuscripts of all the books. We are grateful to Shri Majid Hussain for preparing the manuscript of this book. The maps and diagrams included in this book have been drawn by Shri Purushottam of Panjab University, Chandigarh. Our thanks are also due to Shri D. S. Yadav for rendering the book into Hindi in a very short time.

The preparation of curriculum and textbooks calls for considerable expertise and effort in planning the work, screening, reviewing and editing the book, and finally seeing it through the press. For all this, I am grateful to my colleagues in the Department of Education in Social Sciences and Humanities, and particularly to Prof. B. S. Parakh, Dr. K. L. Joshi and Smt. Savita Sinha.

Curriculum construction and development of instructional materials is an on-going process and hence every suggestion from the teachers in the light of their experience would be most welcome. These would be taken into account while bringing out the revised version of this book.

SHIB K. MITRA  
*Director*

National Council of Educational  
Research and Training

New Delhi



## Preface

The 'plus two' stage in the new educational pattern is an important link in the chain of curricular work, wherein it is intended that the student should branch out on the basis of the foundations laid in the first ten years of schooling devoted to general education. Accordingly it would be necessary at this crucial stage to broaden and deepen the students' base in geography so that those offering this subject as an elective may develop a keen and intelligent interest in the subject that is so useful in their everyday life as well as in their areas of specialisation. Further, geography being a subject of an interdisciplinary nature, it helps in the study of allied disciplines, especially those like botany and zoology among the natural sciences and economics, political science, sociology and the like among the social sciences.

Against this background, the Editorial Board, in collaboration with a large number of teachers and various academic agencies interested in improving the teaching of geography at different levels in an articulated manner, developed a framework of curriculum consisting of systematic geography for two semesters and geography of India for the remaining two semesters.

The volume of physical geography meant to be used in the first semester in Class XI is preceded by two chapters dealing with the nature and scope of geography as a discipline and its place in the world of knowledge. In fact, these two chapters provide an introduction to the entire course spread over four semesters.

The present volume "Human and Economic Geography" deals with human and economic aspects of the world environment. The synthesis of the principles discussed in these two volumes and their application would be discernible in the other two volumes, viz. (1) India : A General Geography ; and (2) India : A Regional Geography. The emphasis on the study of India and on regional geography needs no elaboration.

The Editorial Board is also of the view that the study of geography and real appreciation of its nature and methodology remain incomplete if theoretical study is not complemented by practical work in laboratory and field. Hence it has provided for adequate field and practical work in its course outline and has produced a separate volume entitled "Field Work and Laboratory Techniques in Geography".

A Workbook in Geography for Classes XI and XII is yet another addition in the series introduced by the Editorial Board. This move was widely appreciated by geography teachers.

I am grateful to Shri Majid Hussain who has written this book. The maps and diagrams included in this book have been prepared by Shri Purushottam of Panjab University, Chandigarh. We are indebted to him for this work. Finally, mention may be made of Shri D.S. Yadav for rendering this book into Hindi in a very short span of time.

My special thanks are due to Dr. K.L. Joshi and Smt. Savita Sinha of the National Council of Educational Research and Training who were responsible for seeing this book through the press. But for their devoted and diligent work, the book would not have seen the light of the day in the present form.

Curriculum construction and development of instructional materials is an on-going process and hence every suggestion from the teachers in the light of their experience would be most welcome. These would be taken into account while bringing out the revised version of this book.

MOONIS RAZA

*Chairman*

New Delhi

Editorial Board for Geography

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## CHAPTER 1

# Major Resources of the Earth <sup>11<sup>th</sup> June '82</sup>

A resource has been defined as any means of attaining given ends. A resource satisfies human wants. Water, air, sunshine, land, soil, forests, wildlife, fishes, minerals and power are resources all useful to man. The vast deposits of mineral resources were unknown to pre-historic man. He did not know of them or their uses and, therefore, to him they were not resources as they did not affect his life. Until someone invented the sailing ship, and later, the windmill, the wind was of little use. Coal had no real significance before the invention of the steam-engine. Waterfalls have long been used to turn wooden mill wheels but became very valuable when harnessed to generate electricity. Uranium was of no use until recently. In brief, whether a natural object is useful depends upon man's ingenuity and the level of his technology and scientific advancement. Resources which are developed for satisfying human wants are produced by an interaction of nature, man, and man's culture. But human wants continue to multiply. With the passage of time man improves his knowledge and develops new resources to meet his increasing demands.

### CHANGING CONCEPT OF RESOURCE

The term 'natural resource' has undergone an expansion in meaning as a result of man's

greater understanding of his relationship with the world he lives in. Early in the twentieth century natural resources were viewed primarily as sources of valuable and useful commodities. They were mostly the raw materials present in the environment that man could use to some purpose, e.g., minerals and fuels, forests and grazing resources, wildlife, and fishes. More recently the concept of a natural resource has been broadened to include the total natural environment, that is, the entire surface layer of the earth, because all parts of the earth's surface are of some use to man in that they contribute to the production of necessities and amenities that people demand. Thus from this point of view all living and non-living elements of the atmosphere, the oceans, the deserts, the polar, tropical and temperate regions, and the interior of the earth too have all become valuable resources. All these resources are to be utilised scientifically and managed with care to provide necessities and comforts to the present and future generations.

### CLASSIFICATION OF RESOURCES

The environment we live in has ample and enormous reserves of natural resources. These resources, for a systematic study, may be classified into the following types : (i) biotic

and abiotic, (ii) exhaustible and inexhaustible, (iii) potential and developed resources, (iv) raw material and energy resources, (v) agricultural and pastoral resources, and (vi) mineral and industrial resources.

### Biotic and Abiotic Resources

The traditional classification of natural resources distinguishes between those that are *biotic* and those that are *abiotic*.

#### Biotic Resources

The most clearly recognisable natural resources are those consisting of living things. Forests and their products, agricultural crops, animal fodder, wild and domestic animals, birds, reptiles, and fishes are all biotic resources. (They can continue to reproduce and regenerate their population as long as environmental conditions remain favourable and an adequate seed source is maintained.) All biotic resources are, therefore, renewable. The renewability of a living resource varies with the species and the area involved. Agricultural crops grow to maturity within a year and die back. They are annually renewable. Perennial plants and trees may have much shorter rates of renewability. The maple trees in the valley of Kashmir, locally called as *Chinar* grow at a very slow rate and these trees are, therefore, preserved by the government and felling them is liable to be punished. Many species of wild animals, e.g., the lion and the tiger are in danger of extinction and their preservation has become essential for their survival.

#### Abiotic Resources

Abiotic resources consist of non-living things. In general, they may be considered mostly non-renewable. Minerals and fossil-fuels, such as coal, petroleum, and natural gas are abiotic and least renewable resources.

These resources are exhausted by use while their rate of formation is exceedingly slow. All minerals are abiotic resources and they are non-renewable. Certain abiotic minerals, such as iron and aluminium and are widely distributed throughout the earth's surface. Other minerals, such as gold, silver, and platinum are much more limited in their distribution and quantity. The usefulness of the abiotic resources (rocks and minerals) depends upon their accessibility and concentration. Past experience shows that abiotic resources are exhaustible. The gold deposits of the Kolar gold mines (Karnataka), and the iron ore deposits of the Mesabi range (U.S.A.) have been considerably depleted.

Some abiotic resources, however, are renewable. Manganese ore, for example, is relatively scarce on the land surface but it is continuously being formed in nodules on the ocean floor, just as cobalt, nickel, and copper are. The rate at which the nodules of manganese, cobalt, and nickel are growing through chemical precipitation from sea-water exceeds the rate at which these minerals are being used. Although, technology for the recovery of these minerals from the ocean floor does not exist so far, attempts in this direction are being made and with the development of ocean floor mining technology, these metals will be considered renewable.

#### Exhaustible Resources

The metals and minerals obtained from earth are exhaustible. Once these minerals are taken out they cannot be replaced. All non-living things obtained from the earth by mining to satisfy human wants are exhaustible. Coal, petroleum, natural gas, iron ore, copper, aluminium, bauxite, uranium, thorium, and sulphur are some examples of exhaustible resources. Continuous mining of a given mineral will exhaust the ore and, therefore,

mining and extraction of minerals is called a 'robber industry.' Men may apply the latest techniques to extract every bit of valuable ore, but they cannot increase or replace the minerals that are mined. The natural replacement of minerals through geological events is so slow, that it can have no relevance to mineral extraction. All minerals are, thus, a finite and declining resource available to man.

Fossil-fuels, e.g., coal, petroleum, and natural gas are those organic materials that have been converted from their original forms by physical and chemical processes within the earth's crust into a solid (coal), liquid (petroleum) or gas (natural gas). If these substances are completely burned when used as fuel they cannot be renewed and, therefore, they are the most rapidly exhaustible resources.

On the basis of existing knowledge the amount of fossil-fuels in the earth's crust, it has been estimated that the supplies of petroleum and natural gas may be exhausted by A. D. 2070 if used at the rate anticipated. Although coal supplies are greater, the rates of use indicate that they cannot be expected to last for more than a few centuries. Although nuclear fuels are inorganic in nature, like fossil-fuels they are destroyed when used in the production of heat energy. The supplies of uranium and thorium though relatively abundant, are also exhaustible and non-renewable.

Metallic minerals such as iron, copper, lead, tin, zinc, aluminium, silver, gold, antimony, platinum, nickel, manganese, cobalt, uranium, thorium, and titanium, and non-metallic minerals, e.g., mica, graphite, asbestos, sulphur, phosphate, gypsum and potash deposits are fixed in quantity, they cannot be increased or replaced. In fact, the known mineral deposits are decreasing so rapidly, that in future, civilisations may be threatened

by their shortage, unless the situation is improved by new discoveries of deposits and use of substitutes. In the developed countries of Europe and America, already a shortage of mineral resources is being felt. India is favourably placed in many of the exhaustible resources; their use, however, needs to be carefully made to save them for use by our future generations.

### **Inexhaustible Resources**

Resources which can be renewed by reproduction or by physical, mechanical, or chemical processes are known as inexhaustible resources. Solar energy, air, water, wildlife, forests and human beings are examples of inexhaustible resources.

Solar energy is an inexhaustible resource relative to the human time scale and the use that man can make of it. The actual amount of solar energy reaching the surface of the earth is, however, determined by the conditions of atmosphere, relief, and location of place which can be and is affected by man.

Air is also an inexhaustible resource in the sense that the use made of it by man and other living things, e.g., plants and animals have little effect on its total quality. The quality of air, however, as measured in terms of its chemical composition, is subject to human interference. For life to exist on the earth there must be a proper balance among the nitrogen, oxygen, carbon dioxide, water vapour and other components of the atmosphere.

Water may also be considered an inexhaustible resource, because the total supply of water on the surface of the earth and in the atmosphere is hardly affected by the activities of man. Water is not destroyed by most human uses, although it may be held for a time in combination with other chemicals. Water that falls from the atmosphere in the form of rain and then runs off the land

surface to form streams and rivers that eventually reach the ocean or lakes, generally operates on a one-year renewal cycle. The total amount of water from ocean to air to land and back to ocean is known as the hydrologic cycle. It is the renewal cycle that determines the amount of water available for human use and for all other purposes in any particular location.

However, we should note that air and water pollution as well as water shortages are already becoming grave problems in some regions of the earth's surface, especially in highly industrial and urbanised areas like England. This brings out the lesson that it is very necessary to make a proper use of nature's 'free' gifts too.

#### Potential and Developed Resources

The power that could be generated if all the waterpower resources in the country are used is known as its potential resource while the actual hydroelectricity generated is known as a developed resource. Running water from streams, rivers and melting glaciers has been utilised for the generation of electricity. The development of hydro-electric power depends on a number of factors, e.g., mountainous topography, adequate and seasonally well-distributed rainfall size of the river and the volume of water passing through it, suitable sites for the construction of dams, power houses, and markets and any alternative source of power, etc. In most of the countries, especially in the developing countries the potential resources are not appreciably developed.

Hydro-electric power potential is not equally distributed around the world. Some countries, e.g., the U.S.A., Switzerland and the Congo have many more potential sites for hydro-electric power stations than others, e.g., Britain, the Netherlands, Pakistan and Bangladesh. However, even those countries

with moderate potential do not always develop hydro-electric power if alternative sources of power are available. In many countries of Africa, South America, and in Asian U.S.S.R. many potential hydro-electric power sites are ignored because the small population does not provide an adequate market for the power generated.

Of the total estimated hydro-electric potential of the world, only a fifth is developed, mainly in Europe and North America, each of which accounts for almost 40 per cent of the world's developed hydro-electric potential, although they have together less than 15 per cent of the world's total water power potential. The following table shows the developed and potential water-power resources by continents in 1970.

TABLE I  
Developed and potential water power by continents  
(by percentage of world total)

Continent	Potential H.E.P.	Developed H.E.P.
North America	8.9	38.6
Europe	6.0	34.7
Asia (Excluding U.S.S.R.)	23.4	10.7
U. S. S. R.	16.8	9.5
South America	16.9	3.6
Oceania	4.9	1.8
Africa	23.1	1.1
	100.00	100.00

In terms of hydro-electric power production (Table I) the U.S.A. leads, accounting for about 23 per cent, followed by Canada (15 per cent), the U.S.S.R., Japan, Italy, France, Sweden, Norway and Switzerland. The rest of the world makes up the remaining 19 per cent. Large parts of the tropics in Asia, Africa and South America, which have excellent potential for hydro-electric power development have relatively little developed water power despite the fact that they have some very large hydro-electric projects. Lack of capital as well as a low rate of industrial

growth and, as a consequence, a small potential market are two of the major hindrances in harnessing their vast potential water power resources. In Europe, however, the large potential market has led to the development not only of a few large schemes but also numerous smaller hydro-electric power sources.

Some of the world's largest developed hydel-power projects include the TVA (the Tennessee Valley Authority) in the U.S.A., the Niagra on the U.S.A. Canada border, the Volga, the Don and the Dnieper systems in the Soviet Union, the Kariba Dam on the Zambezi in Africa, and the Damodar Valley Project, the Bhakra-Nangal, the Hirakud and the Koyna in India. The Mekong project in South-east Asia when completed will produce abundant hydel power in that region. The Aswar Dam on the Nile is one of the important projects in the world.

India has developed many hydro-electric power resources under the Five Year Plans. On many of the rivers multipurpose projects have been constructed. Multipurpose projects have been constructed on rivers like the Sutlej, the Ganga, the Yamuna, the Kosi, the Damodar, the Mahanadi, the Godavari, the Krishna, the Kaveri and many other swift moving rivers of peninsular India. The uneven distribution of rainfall in India, with long droughts and frequent floods, makes dam construction an essential feature of water management for flood control, water storage, and irrigation. The mountainous topography of the Himalayan region with perennial streams having their sources in the snow-capped peaks of the Himalayas and a large demand of electricity in the densely populated and fertile plains of India, provide ample opportunities for the development of hydro-electricity in India. India has a bright future in the matter of hydro-electricity, the need is

to harness the streams and rivers mainly of the north.

### *Raw Materials*

The presence of raw materials is the fundamental condition of all industry. Among primitive people, industry naturally comes into being near places where raw materials are to be found. Owing to the fact that primitive man was obliged to use the gifts of nature for all his purposes, articles made by early people show a deep impress of their place of origin. This is proved by ethnological collections, including Central Africa hideshields, American feather cloaks, and primitive Indo-Chinese bamboo gadgets. Even in the most advanced stage of civilisation possession of a raw material favours the rise of industrial activity.

Man gets primary products from agriculture, forestry, fishing, animals, and mining. These projects serve as raw materials for our industries. Cotton, woolen, silk, jute textiles, and sugar industries are entirely dependent on agricultural products for their raw materials, while in the paper, pulp, gum, lac and timber industries, forest products are consumed as raw materials. All the metallurgical plants, iron and steel industries, machine tools, electric goods, chemical industries, explosives, automobiles, aircraft manufacturing, railway engines, and shipping industry are entirely, or in part, dependent on mineral ores and the materials obtained from the earth crust. In the food processing, canning, and dairying industries the agricultural, poultry, fishing, and dairy products are used as the raw materials. In some of the industries like synthetic fibres, perfumes, and petrochemicals, coal, petroleum, and gas serve as the raw materials.

The raw materials—agricultural land, forests, fishes, animals and minerals—are unevenly distributed on the surface of the earth,

and therefore, some countries are favourably placed in the matter of raw materials while others have to import them for their industries from the far and distant parts of the world. Thus most of the countries are not self-sufficient in raw materials and nations are thus interdependent to fulfil their demands of raw materials

### Energy Resources

The resources used as power to run machines, industries, and automobiles are known as energy resources. Primitive man relied wholly on his muscles to do his work. In ancient times slaves were used for carrying loads, water, and ploughing land with animals. With the invention of modern tools and machines the need of power greater than manual power became urgent. As a matter of fact, modern manufacturing is almost impossible without powers like coal and electricity. The principal sources of heat and power are coal, petroleum, natural gas, electricity, nuclear, geothermal, and tidal energy.

Nowadays power is required in practically every aspect of our lives. It is needed to cook to provide light and heat, to propel vehicles of different kinds, and to drive machinery in the industrial plants.

The major fuels in use today are coal, oil, and electricity, but in some cases other fuels including wood, peat, natural gas, and nuclear fuels are used to produce power. These together with water, are harnessed to provide hydro-electricity. Petroleum is in great demand in the modern industry. It provides fuel for heat and lighting, lubricants for machinery and raw material for a number of industries. It occurs in great abundance, it is easily obtainable and it has a wide range of domestic and industrial uses. It is, therefore, often called 'black gold.'

The exploitation of natural gas fields and its use in domestic and industrial purposes is a recent development. Natural gas is mostly consumed near the source. Its export is negligible. With the help of pipelines the gas can be transported to the consuming centres. But the construction of pipelines and their maintenance is expensive. Natural gas has a great scope of being used in the chemical industry for making synthetics. The Glass and cement industries mainly consume natural gas for its purity. It is, however, not suitable for automobiles, planes, ships, and locomotives because of mechanical reasons.

Electricity is becoming more and more important in the world's economy. It can be used conveniently for domestic and industrial purposes. Electricity can be generated from thermal plants using coal, petroleum, and natural gas. It can be obtained from nuclear plants and generated by running water. It is therefore, not like coal or oil which are limited and exhaustible and therefore, electricity to a great extent can be called an inexhaustible source of power and fuel. Electricity is an invisible fuel which is clean and easy for consumers to use. Moreover, it is easy to transmit by means of wires and cables over moderate distances.

Nuclear energy obtained from uranium and thorium is a modern source of energy. With the development of technology it is used for domestic and other purposes. Another source which is important in some countries is geothermal energy, i. e., energy derived from volcanic phenomena such as hot springs. Geothermal energy is used in Iceland, Italy, and New Zealand. Geothermal energy has the advantages of free availability, and of causing little or no pollution when electricity is generated from it. Tidal energy, though in small quantity, is also obtained in some of the developed countries of the world. Nuclear

power is expected to overtake other forms of electricity generation in the near future. It is probably fair to say that nuclear power will play a much more prominent role in future power supplies, but it is difficult to foresee if it can entirely replace conventional generation methods.

### Agricultural Resources

Agriculture is a basic and traditional form of human activity. It includes cultivation of crops and domestication of animals. Agricultural land is, therefore, the most basic of the world's vast and varied resources. The population of the world depends on agricultural resources for food, clothing and shelter. It provides fodder and solid food to the domestic animals, and raw materials to the agro-industries. The availability and production of agricultural resources, are to a great extent dependent on climate (temperature, rainfall, adequate sunshine, and a long enough growing season), topography, soils, water supply, and socio-economic factors. Agricultural resources are renewable from time to time, the cycle being completed usually in one year. Thus they can be termed as biotic or inexhaustible resources, provided the environmental conditions remain favourable for the germination, growth, and harvest of crops.

The chief agricultural resources, comprising of crops cultivated by man, may be classified into five groups : (i) cereals—rice, wheat, maize, pulses, rye, oats, millets, and barley ; (ii) beverages and tobacco—tea, coffee, cocoa, (iii) sugarcane, sugarbeet, spices, vegetables, and fruits (iv) fibres—cotton, jute, hemp, and flax ; and (v) rubber, oilseeds, groundnuts, soya beans, and castor.

Of all the crops, cereals are the most important as they constitute the staple foodgrain of the people all over the world. Wheat, rice, and maize are the three important cereals

though a wide range of millets in the tropics, and rye and barley in the temperate regions provide staple cereals for the poorer section of the society.

### Pastoral Resources

Pastoral activity means the rearing of animals whether for meat, milk, wool or hides.

It may be on a large scale, e.g., the sheep farms of Australia or on a small scale, e.g., a small Danish Dairy herd of a few animals. Pastoral farming may be primitive—as carried on by nomads—or highly scientific as in Denmark and Holland.

In the world's natural grasslands, e.g., temperate and tropical grasslands, the whole economy is dependent on animals. The pastoral resources provide food to man in the form of meat, milk, butter, and cheese and there are many industries based on animal by-products such as hides and hair. Hides are the basis of many industries producing footwear, clothing, bags, straps, suitcase, saddlery, industrial, agricultural, and military equipment. Bones are often ground up to make fertilisers, horns are used for decorative goods and household utensils, e.g., for knives and swordhandles. Some animals with rich and lustrous fur, form the basis of luxury fur clothing. The wool and hair of certain animals, e.g., the sheep, angora goat, alpaca and camel are important as the basis of textile industries.

The production and consumption of pastoral resources is often a guide to the standard of living of a nation. The greatest consumers of meat and milk are the countries of Europe, North America, Australia and New Zealand. Countries with low consumption of meat, milk, and butter are the underdeveloped and developing countries of Africa and Asia. Pastoral resources are however, a great source of food and raw material for

many textile and food processing industries of the world.

### Mineral Resources

In pre-historic times the only minerals used by men were rocks such as flints, from which tools and weapons were fashioned during the Stone Age. However, men soon learnt the art of smelting metals and this allowed them to make use of first bronze (the Bronze Age) and later iron (the Iron Age) for their tools. Our present material civilisation has been brought about to a large extent by the knowledge and application of metals and minerals, for they provide the basis of machinery on which modern manufacturing industry depends. The developments in the science of metallurgy have been very vital especially the ability to make steel from iron. Steel is used for locomotives, steamships, automobiles, armaments, tools, cutlery and factory machinery as well as being of great importance in the construction industry, that is, in bridge building, reinforced concrete and so on. Other metals have more specialised uses. For example, tin is used for tin plating, aluminium is used for light weight metal construction such as aircraft manufacture and copper is vital to the electronics and telecommunication industries for its role as an electric wire. Today, therefore, though iron and steel still form the basis of our civilisation, a vast range of other

metals and minerals is also required

The development of science, engineering, and technology has made it possible to extract and use great varieties of minerals in increasing proportion. Modern civilisation, is, in many respects dependent on mineral products. Machines, ships, armaments, buildings, coins, and all the other things connected with modern civilised life are more or less associated with minerals. But no nation has all the various minerals required by its industries within its border. Hence all are bound together by a chain of economic dependence in respect of various minerals.

Mining has already become the world's second largest industry, next to agriculture. Unlike agricultural crops, however, mineral products are fixed in quantity. Mineral reserves cannot be increased or replaced. In fact minerals are decreasing rapidly and future civilisation may be threatened by their shortage unless it is counteracted by new discoveries and use of substitutes.

Some of the important mineral resources of the world are iron, copper, lead, tin, zinc, aluminium, silver, gold, mercury, antimony, platinum, manganese, nickel, chromium, molybdenum, cobalt, tungsten, uranium and thorium. Mineral fuels include coal, petroleum, and natural gas, while the nonmetallic minerals consist of mica, asbestos, graphite, sulphur, diamond, phosphate, gypsum and potash.

## EXERCISES

### Review Questions

1. Answer the following questions precisely.
  - (i) Define resource and give the changing meanings of resource.

- (ii) Distinguish between biotic and abiotic resources, giving three examples of each.
  - (iii) Distinguish between exhaustible and inexhaustible resources, giving three examples of each
  - (iv) Distinguish between potential and developed resources
  - (v) Distinguish between raw material and energy resources giving three examples of each.
  - (vi) Distinguish between agricultural and pastoral resources and give suitable examples in support of your answer.
2. Give the four major sources of natural resources and classify the following accordingly :
- |              |                    |                    |              |
|--------------|--------------------|--------------------|--------------|
| (i) iron ore | (v) thorium        | (ix) running water | (xiii) tea   |
| (ii) lac     | (vi) sandalwood    | (x) cotton         | (xiv) marble |
| (iii) whale  | (vii) aluminium    | (xi) jute          | (xv) fur     |
| (iv) ebony   | (viii) natural gas | (xii) tobacco      | (xvi) hides  |
3. Classify the following into (a) the exhaustible and inexhaustible and (b) the biotic and abiotic resources :
- |                  |               |                |             |
|------------------|---------------|----------------|-------------|
| (i) solar energy | (iv) air      | (vii) water    | (x) cereals |
| (ii) forests     | (v) coal      | (viii) thorium |             |
| (iii) copper     | (vi) wildlife | (ix) bauxite   |             |
4. Mining and extraction of minerals is known as the 'robber industry.' Explain.

### Finding out

- (i) List those resources that are now in great demand and are being put to more productive uses.
- (ii) Find out in your own neighbourhood some of the natural resources.

### Cartographic Work

On an outline map of the world, show the following :

- (i) Agricultural and pastoral areas of the world.
- (ii) The major industrial areas of the world.
- (iii) The major hydro-electric power projects of the world.
- (iv) The major fishing areas of the world.

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## CHAPTER II

# World Distribution of Resources

The strength of nations—social, economic, and political—is mainly determined by the resources they command and their capacity to utilise and conserve these resources. Forests, fisheries, minerals, and water are some of the important resources which help in the agricultural and industrial development of a nation and ultimately in improving the standard of living of its people.

### FORESTS

A forest is a complex ecological system dominated by trees. Originally, forests covered probably one-fourth of the earth, but owing to overuse and misuse, they now cover only fifteen per cent of the earth's surface. Man has cleared vast areas for forest products and for land to use for crops and pastures.

In comparison to agriculture and minerals, forest industries play a relatively small part in the world's economy. Wood has, however, always been used, wherever it was available as a fuel, both for domestic and industrial purposes. Before coal was widely mined, wood was used, often in the form of charcoal, to smelt minerals, and even today in countries where coal or oil are in short supply, wood is used in industry, to power railway locomotives and to generate electricity. Wood is also a vital material in the building and construction

industry, and in furniture making. Wood is also the major raw material of the enormous pulp and paper industry, and is used in commerce and packing. The world consumption of wood is rapidly expanding. Wood is important in the modern textile industry. In addition to these major products, forests supply a wide range of minor products such as pitch, turpentine, tannin, nuts, and gums.

### Major Types of Forest

The growth, development, and type of forests depend on a number of factors e.g., location, soil, temperature, rainfall, wind, altitude, distance from the sea, aspect of slope, and sunshine. Owing to variations in these factors, the world contains many species of forest plants. The natural vegetation of most parts of the earth is some form of forests but some areas, where the climate is extremely cold or too dry, cannot support forest growth. The two main areas in this category are the polar regions where the growing season is short, the ground is often frozen or snow or ice-covered and where rainfall is also very low (often about 225 mm); and the deserts where rainfall is scanty, atmospheric humidity is also low and where the soils are too thin to support trees. Moreover, the high mountainous parts of the world, especially the mid and higher

latitudes are too cold or lacking in soil to support trees.

In the temperate and tropical grasslands also there are a few trees and in most areas this is due to the dryness or seasonal rhythm of climate. However, it is now thought that the vegetation of many grasslands has been reduced or eliminated. For example, savannas occurring as patches in forests or around the

2. The temperate deciduous forests; and
3. The coniferous or taiga forests.

### *The Tropical Rain Forests*

Tropical forests occupy low latitude areas near the equator. These forests known as 'selva' are found in the Amazon Basin of South America, Zaire, and the Congo Basin of Africa and in the South-East Asian countries

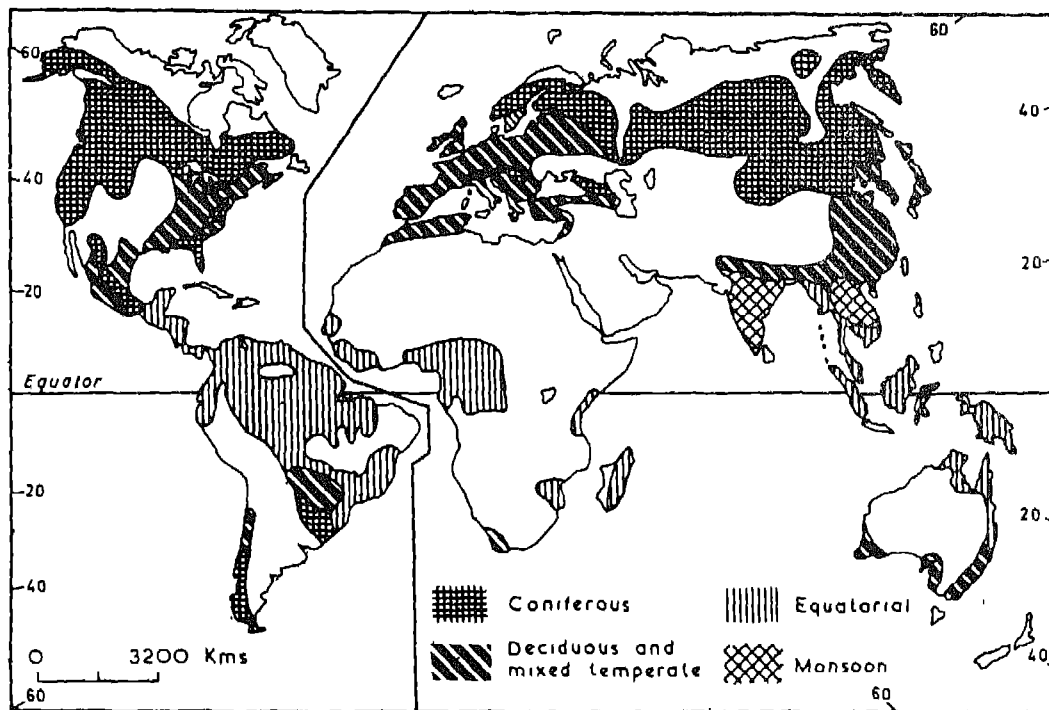


Fig. 1

margins of tropical forests may have degenerated from the forests as a result of burning by pastoralists or shifting cultivators over many hundred years. In north east India, Rajasthan and other parts of the country, tribes periodically burned large areas in order to facilitate hunting and for shifting cultivation. In the humid, temperate and tropical areas there are three major classes of forests (Fig. 1).

1. The tropical rain forests;

(Malaysia, Indonesia, New Guinea, Indo-China, Burma, Thailand,) and India. Owing to high temperatures and abundant rainfall throughout the year, the forests are mostly evergreen. The selva has a heavy canopy of foliage and their crowns form such a thick interlacing mass that sunlight does not reach the ground. Below this canopy is a dark, damp, stuffy, and gloomy vault, crowded with long, slender and unbranched tree trunks,

Huge lianas or climbers, after climbing up the giant trees, hang from the roof, coiling and twisting and forming a tangle on the ground which is almost impenetrable. On the stems of these trees grow epiphytal plants.

The equatorial forests are evergreen. There is no seasonal change to affect the vegetation and therefore, some of the plants may be bursting into leaves and flowers while others bearing their fruits. The trees are rarely gregarious, an acre of forest commonly contains but one or two specimens of a single species. It makes the commercial utilisation of forests very difficult as the extraction of specimens, however, valuable may be almost impossible. The important trees of selva are mahogany, ebony, rosewood, dyewood, cedar, rubber, guttapercha, cerba, Brazilnut, oilpalm, cinchona and ironwood.

In the monsoon areas forests are less luxuriant than equatorial forests because of the seasonal draught, but are characterised by a thick undergrowth of shrubs and small trees and by dense thickets of bamboo. Sal, teak, palm, sandalwood, jarul, shisham and bamboo are some of the important varieties of monsoon forests, and coastal areas in the tropics are often fringed with swampy mangrove forests. The wood of the mangrove species has many uses but the many aerial roots of the trees make access difficult.

Besides wood, lac, gum, sandalwood, rubber, camphor, cinchona, myrobalan and guttapercha are the important products of the tropical hardwood forests.

### *The Temperate Deciduous Forests*

Temperate deciduous forests are found to the north of monsoon forests where temperature and rainfall are moderate. The trees are mostly deciduous, shedding their leaves in autumn and remaining leafless throughout the cool winter, and they yield a wide variety

of hard and soft woods. Like the tropical forests, the temperate deciduous forests have a variety of species scattered irregularly through the forests, including many shrubs and small plants, but neither the tall trees nor the undergrowth are as luxuriant as those in the tropical forests. The hardwood, while being very durable and strong is not usually as heavy or as difficult to work as are tropical hardwoods. The chief commercial species are : oak, ash, beech, elm and poplar.

The temperate hardwood forests have suffered greater destruction at the hands of man than any other forests. Because of the favourable mid-latitude climate and the rapid expansion of population in these areas, the forests have been extensively cleared to make way for agriculture and industry, and the areas of forest which remain represent only a fraction of the original cover. Temperate hardwoods have also been used for house building and shipbuilding for many generations as well as for fuel, and have thus been greatly depleted. They now occupy only those areas found unsuitable for agriculture or areas which are remote from the centres of settlement.

The main areas of temperate hardwood forests are in northern China (including Manchuria) and Japan, where agricultural populations have lived for thousands of years; West, South and Central Europe, where the growth of agriculture and industry has made very great inroads into the forests, and Eastern North America where, though more recently settled, expansion of agriculture and industry has been extremely rapid and where massive exploitation has greatly reduced their extent or reduced their value. Some temperate hardwoods are also found in southern Australia, especially in Tasmania and Swanland (Western Australia).

In the Mediterranean region, where

summers are dry and winter records about 40 inches of rainfall, deciduous forests of broad leaved trees with long roots and thick barks are found. The chief trees are oaks, olives, figs, pines, firs, cedars, cypresses, and junipers. Nuts, olive oil, citrus fruits, and corks obtained from the bark of oak trees are the main products of the Mediterranean forests.

### *The Coniferous Forests*

A broad belt of temperate coniferous forests known as taiga extends around the world on land lying between 50°N and 70°N. Such forests are also found in the Himalayas in Kashmir and in the Alps at an altitude of 5000 feet to 7000 feet above sea level. Conifers are tall, straight, evergreen trees with narrow, needle like leaves, and take their name from the cones in which they bear their seeds. Only a few conifers, such as larch, are deciduous. Most coniferous trees are soft woods and are light in weight, which make them easier to cut and transport. Though they often grow to a height of 100 feet (30m) or more, the coniferous trees do not have the wide buttress roots which make tropical trees so difficult to fell. Moreover, although there is a wide variety of species in the spruce, pine, fir, and larch families, the trees usually occur in pure stands consisting of one particular species. These forests are only moderately dense and they become appreciably thinner in colder or drier regions. Taiga trees become dwarfed towards the northern margins.

The major regions of coniferous forests are Western North America, Central and Eastern North America, Northern Europe, Asian U.S.S.R., and Southern Chile; part of the Brazilian plateau, the Northern Island of New Zealand, South Africa, and Australia have only small areas of natural coniferous forests and these are of only local importance (Fig 1).

### **Forest Problems**

For thousands of years the action of man has been gradually diminishing the world's forest resources by burning, clearing, and felling trees for fuel, or to make way for agriculture, settlement, or industry. This was a relatively slow process in many areas, but it has now been speeded up by the population explosion. In many underdeveloped countries today, where wood is the main source of fuel, where additional land is constantly being developed for agriculture or where traditionally extensive forms of agriculture such as shifting cultivation are practised, the forests are still being very rapidly reduced. This is true of many African, Asian, and South American countries.

In Europe, the development of industry and shipbuilding have led to depletion of temperate hardwood reserves. The growing population also put pressure on timber supplies for the construction industry. Moreover, the use of wood for paper and textiles created an enormous and an evergrowing demand. In China and India forests have been greatly reduced for agricultural use of land. Now most of the governments are, however, aware of the seriousness of the problem.

Thus the story of forestry is one of exploitation and then conservation. It is a story of wanton destruction chiefly during the nineteenth century. With the rapid increase in demand for timbers, pulpwood, and synthetic fibres in the world, the forest has been subject to rapid exploitation by man throughout the ages. Besides the reckless cutting of timber by man there are other factors namely fire, insects, disease, and wind storms which are also responsible for the destruction of forests to some extent.

If forests are to maintain their utility and productivity, the depleting agents of forests like fire, insects, overgrazing, overcutting, and waste in utilisation are to be held in check.

Forest productivity can be increased through silviculture, and quick and adequate reforestation after the removal of the mature timber.

### FISHERIES

Fisheries mean the capture and processing of sea, coastal, and inland aquatic animals as an occupation for profit. It has been estimated that there are about 30,000 species of fish, many of which live only in fresh water. Fresh water fish are found in rivers, lakes, and ponds and are important mainly for local consumption, while sea water fish are important both for local demand and for wider demand outside.

Men were hunters and fishermen before they became cultivators, and fishing is, therefore, one of the oldest occupations of mankind.

Increasing human numbers will make the efficient harvesting of food from the sea more and more important. Fish are a vital source of food, especially in countries like Japan, Norway, Iceland, and Newfoundland where the land is mountainous and agriculture cannot be easily developed over new lands. The productivity of the sea in regard to fisheries is affected by many factors e.g., the depth of the water, the ocean currents, the temperature, and salinity determine the amount of plankton (fishfood) present.

### Principal Fishing Grounds

Although fish may be caught in the sea and in fresh water in any part of the globe, Fig 2 shows that the world's major commercial fishing grounds are located in the cool waters of the northern hemisphere in comparatively

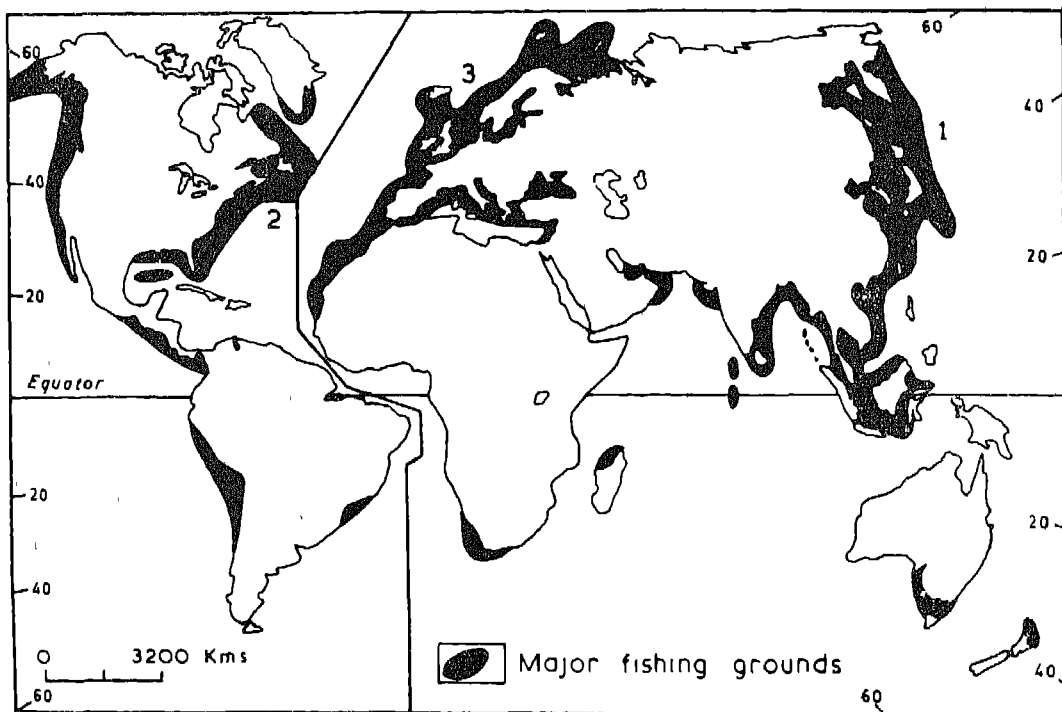


Fig. 2

higher latitudes. Commercial fishing is little developed in the tropics or in the Southern Hemisphere. There are three major fishing grounds (Fig. 2) in the world which are all located in the temperate latitudes of the Northern Hemisphere. The major fishing grounds are: (1) the North-West Pacific; (2) the North-West Atlantic; and (3) the North-East Atlantic.

### *1. The North-West Pacific Fishing Grounds*

The North-West Pacific from the Bering Sea to the East China Sea is the world's greatest fishing region (Fig. 2). Computed in total tonnage of fish caught, the annual yield is well over 10 million tons, of which Japan alone accounts for about 7 million tons. The rest is shared by China, Korea, and Eastern U.S.S.R. There are probably more people engaged in fishing here than in any other part of the world. Commercial fishing is best developed in Japan where the industry is very highly organised and the fishing methods are modern.

The North-West Pacific fishing ground has the geographical advantage of location in the Northern Pacific area, the confluence of Kuro Shio warm water with the cold water of the Kuril current, the scientific management of fisheries and the great demand of fish in the domestic market have made Japan one of the leading countries of the world in fisheries. villages, large and small are found all Fishing along the rugged coastline from Hokkaido to Kyushu. From the Japan Sea the Japanese capture heavy hauls of sardines, herring, mackerel, sharks, salmon, yellowtail, cuttlefish, shellfish and crustaceans, of which crabs and lobsters are the most important. Deep sea fishing for cod, tuna, bonitos, turtles, mackerel and halibut has developed more recently. Japan consumes more fish than any other country in the world.

### *2. The North-West Atlantic Fishing Grounds*

This fishing ground stretches between Newfoundland and New England (U.S.A.). The Newfoundland waters are a meeting place for the warm (Gulf Stream) and the cold (Labrador) currents, which favourable to the development of swarms of plankton (fish-food). Besides, the presence of 'banks', or submarine plateaus, grooved by ice erosion and littered with moraines, locate one of the most productive fishing grounds in the Atlantic.

The Newfoundland fishing grounds have been visited by the fishing fleets of Britain, France, Spain, and Portugal and these have now been joined by those of Japan and the U.S.S.R. Besides cod, herring and mackerel are caught in the surface waters, halibut, haddock, hake and flounder in the deeper waters. In Newfoundland, fishing provides employment for ninety per cent of the population. Fish in all its various forms, fresh, crude, preserved or canned, is sent in large quantities to mainland America or exported to Latin America, Southern Europe, and North Africa. The fish stocks in the Newfoundland grounds are, however, now depleted by the intensive fishing methods of recent years.

### *3. The North-East Atlantic Fishing Grounds*

The North-East Atlantic fishing region extends from Iceland to the Mediterranean shores (Fig. 2). The North Sea is the largest fishing ground in the world. It is very shallow and abounds with fishing banks (Dogger and Great Fisher Bank). The countries surrounding the sea, i.e., Great Britain, France, the Netherlands, Belgium, Denmark, Norway, Sweden, Germany, Ireland and Iceland are densely populated, providing a good market for catches.

The principal fish caught are herring, cod, and mackerel. In the colder northern waters, haddock, turbot, and halibut are caught and

hake, skate, plaice, and sole are also important. Farther South, anchovies, pilchards, and sardines are the main species and some tuna are also found. The North-East Atlantic region, with an annual catch of about 9 million tons, is the largest fish exporting region in the world.

The North-East Pacific, adjacent to the shores of North America from Alaska to California is also a rich fishing region. In this area, salmon is the most important fish caught, it is mostly exported as canned salmon. Halibut, herring, tuna, sardine, crabs, shrimps, and oysters are also caught for the North American markets

Tropical waters, though exploited on a small scale for centuries, have less fishing potentials because fish of commercial species are fewer. Tropical seas are richer in species than the colder seas, but they are poorer in the quantity of fish, and they therefore do not have many important centres of high sea fishing. Moreover, there are few wide continental shelves—except South-East Asia—and coastlines are often straight and unsheltered. In the tropical latitudes fish species include redsnapper, mullet, sea trout, flying fish, spanish mackerel, drum, and flounder.

### **Fishing in India**

Fish is an important item in the diet of people living in the coastal States of India. India has a long coastline, yet only about 8 lakh tons of marine fish are caught annually. The sea fisheries are confined to the coastal waters from the shore in Gujarat, Malabar Coast, Gulf of Mannar, Tamil Nadu coast and the waters over narrow belts of continental shelves and slopes. Here also fishing grounds occupy only a fraction of the entire belts between the coastline and the continental slopes.

The varieties of fish caught along the Indian shores are herring, mackerel, prawns, catfish,

mulletts, pomfrets, Indian salmon, jawfish, flounders, halibut, shark, hakes, haddocks, etc. Schemes relating to the development of marine fisheries have, however, been undertaken and it is hoped that in the near future fisheries would provide appreciable quantities of the vitamin requirements of our growing population.

Fish resource is renewable. Fish continues to reproduce and generate their population as long as environmental conditions remain favourable. But according to the experts of fisheries there are definite signs of depletion. The cod in the North Atlantic, lobster in Newfoundland waters are being caught less in number in recent years. In the case of fresh water fish, the depletion comes through pollution of waters by sewage and industrial wastes. With more knowledge about the environment, behaviour, and their life, positive devices should be introduced to increase the productivity of fish resources.

### **MINERALS**

A mineral is a definite chemical composition, comprising one or more elements and can be identified by its physical and chemical properties. Minerals are of two types (i) metallic e.g., iron ore, copper, aluminium, tin, lead, gold, silver, etc., and (ii) non-metallic e.g., coal, sulphur, mica, manganese, and petroleum, etc.

The mineral resources of the earth have been used to a certain extent since pre-historic time. Modern civilisation is largely dependent on minerals and mineral products. Mining has already become one of the leading industries in the world. But mining is a 'robber industry.' However large the deposit of a given mineral continuous mining will exhaust the ores. Men may apply the latest techniques in order to extract every bit of the valuable ore, or they may continually

prospect new areas to find hitherto unexploited minerals, but they can never increase or replace the minerals that are mined. The natural replacement of minerals depends on geological events and processes. Such processes are so slow that they can have no relevance to mineral extraction, and minerals are thus a finite and declining resource.

## Iron

Iron is widely used in all parts of the world. The main reason for the universal use of iron is its peculiar properties, especially (1) its capacity for assuming many different forms, such as cast iron, wrought iron, magnetic iron, and innumerable forms of steel; (2) its strength; (3) its hardness; (4) its ductility or capacity for being drawn into wire; and (5) its magnetic properties. Because of these qualities iron is the universal material for tools and machines, and has become one of the most important factors in promoting civilisation. When and where iron first attracted the attention of man is not known, though this probably occurred when its ore was accidentally heated in some pre-historic wood fire, with the result that a black mass of the metal was later found in the ashes. Some believe that knowledge of iron and its use extends back to 4000 B.C. in Egypt and China, but this is not certain. In India too, iron was used from very early times and the Iron-pillar near the Qutab Minar in Delhi is a good evidence of ancient iron metallurgy in India.

Our present civilisation is based on iron. It is employed in both the machine which manufactures and the products manufactured. Without it the modern system of transportation would be impossible. It is used in construction, in making our clothing, in growing, handling, and packing our food, and in supplying our water. The per head iron consumption has been considered as significant

indicator of the standard of living of the people of a nation.

Iron ore is mined either by the open-pit method or by the shaft and tunnel method, depending on the nature of occurrence and the depth of the ore. Iron ore is smelted in a blast furnace by heating it with limestone and coke to obtain pig-iron. It can also be used as cast-iron. By removing the carbon in pig iron, it can be used as wrought-iron and can be rolled or hammered. Different metals like manganese, nickel, vanadium, chromium and tungsten are mixed in various proportions with iron and then by tempering it at different temperatures, a variety of steels having different properties can be produced, for example, magniferous steel, chromium-steel, etc.

## *Iron Ore Producing Areas*

Iron deposits are very widely distributed being found in every continent (Fig. 3), but the important ones are found in the U.S.S.R., the U.S.A., Australia, Canada, Sweden, France, Spain and India.

*U.S.S.R.* The Soviet Union is the leading iron ore producer in the world. Most of the iron ore exploitation and associated industrial development is concentrated in fields near Moscow and in Krivoy Rog in the Ukraine, which is the leading iron ore field. Many rich deposits have been found in Siberia and the Ural region near Magnitogorsk, in the Kustanay (Kazakhstan) and Angara (Eastern Siberia). These fields serve major iron and steel centres in the Urals and in the Kuzbas.

*The United States* Although iron ore mining is widely engaged in throughout the United States, the iron ranges of the Great Lakes Region and Alabama produce more than eighty per cent of the total output.

In the Lake Region iron ore is mined in six ranges, but the Mesabi range alone

produces more than the remaining five together. Iron ore is sent from here to the Michigan and Erie lake side towns and to the Pennsylvania coalfields round the city of Pittsburg.

In the State of Alabama to the South of the Appalachians near Birmingham is the second important centre of iron ore. It is favoura-

*France* : France is the fourth iron ore producer in the world, producing about ten per cent of the world's total production. The main iron fields are in Lorraine. The ore beds are about 30 metre thick and lie 180 metre below the surface. The Lorraine iron occurs in association with limestone and

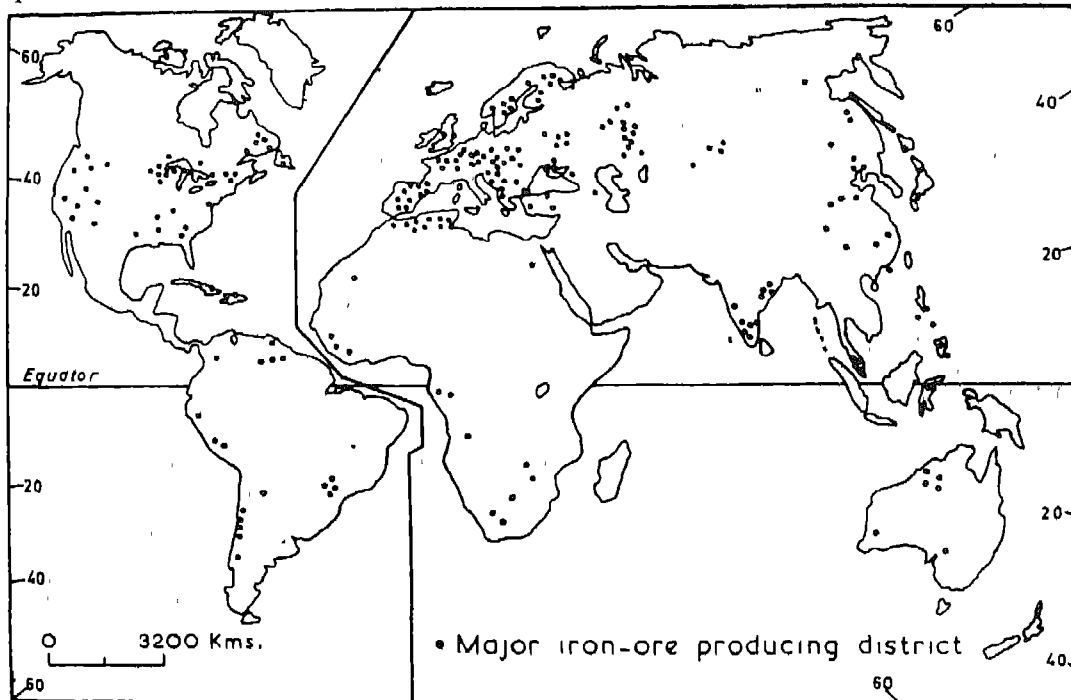


Fig. 3.

bly located near the coalfields of Southern Appalachians and serves the iron and steel industry of Birmingham. The Western iron region of the U.S.A. consists of many scattered iron ore fields in the States of Utah Nevada, Wyoming, and California. The ores are transported to the steel works at San Francisco, Los Angeles, Colorado, Provo and Utah.

Canada has iron ore in the Lake Superior region. But this source has been overshadowed by the rise of iron mining in Labrador and Eastern Quebec.

tends to be self-fluxing which is an advantage in smelting. A little ore is also mined in Normandy, the Pyrenees and in the scattered fields of the Central Massif

*Britain* The main iron ores worked today are the rather lean ores of Jurassic scraplands. Scunthorpe and Frodingham are the main mining centres. Some haematite is found in Cumberland but has been almost exhausted. Iron ore is imported from Sweden, Spain and Algeria to supplement local supplies

*Sweden* Sweden is the leading European producer of iron ore, the deposits at Kiruna and Gallivare being of high quality. Reserves are large and the ores are easily mined by the open-cast method. Sweden, however, has no coal to smelt iron ore. Most of the iron ore is therefore exported. The northerly location where severe winters and short hours of daylight in winter restrict output are the disadvantages of Sweden's iron mines.

*Venezuela* : Its large deposits of high grade iron ore are in the Guiana Highlands. El Pao and Cerro Bolivar are the two important mining areas. The ore is exported mainly to the United States

*China* : China has large iron ore deposits, of which the Manchurian deposits at Anshan are the most actively mined. Other important regions are the Lower Yangtse at Maanshan and Tayeh and the Chung Kiang area. Scattered deposits occur in the Lower Sinkiang, near Canton and on the island of Hainan in the South. The iron and steel industry is established in almost all the major cities, including Anshan, Shanghai, Wuhan, Chungking and Canton.

*Brazil* : The iron ore deposits of Brazil are at Itabira in South-East Brazil. This iron is the basis of the rapidly developing Brazilian steel industry at Volta Redonda and Belo Horizonte.

*Africa* : In Northern Africa, Tunisia, Algeria, and Morocco are the major iron ore producers. In Central Africa there is an extensive deposit of low grade ore, while iron ore in Transvaal is of a higher grade.

*Australia* : Australia has widely distributed ore deposits and its reserves are very large. The recent working of vast iron ore fields in Western Australia, Mt. Goldsworthy, Mt. Bruce, Mt. Tom Price, and at Yampi Sound has greatly increased production. Apart from supplying Australian needs the iron ore is shipped to Japan.

*India* : India has large deposits of high grade iron ore. The mines are at Singhbhum, Mayurbhanj, Keonjhar, Bonai, and Sulaipat. The mines are relatively close to coal fields and are well served by railways. The Lohara and Pipalgaon fields in Chanda District and Redi field in Ratnagiri District in Maharashtra ; the Bailadila, Dauri, Rajhara and Bastar fields in Madhya Pradesh ; Salem and Tiruchirappalli fields in Tamil Nadu are the important iron ore fields in India

### *Copper*

Copper was one of the earliest metals used by men because it often occurs in a pure state and because it is very easily worked For a long time the use of copper was limited to cooking vessels. During the last seventy years, copper has become very important for the world as man has learned to use it for electricity. Among all the common substances copper is the best electrical conductor. Therefore no power plant, telephone, automobile, or electrical machinery is made without copper. The need for good electrical conductors is growing so rapidly that copper deposits are being exploited on a large scale in places such as Chile and the Congo far from the regions where the copper is used.

Copper may be found native, that is, in its pure state, but is more often found in chemical combinations with iron, gold, silver, lead, and sulphur. The world production of copper in 1974 was a little over six million tons.

In the United States copper is, obtained mainly from the Upper Peninsula of Michigan and Arizona. Arizona and Utah are now the chief copper states, but the metal is used mainly in the North Eastern states of the country.

Copper is also found in Chile, Zambia, Zaire, the U.S.S.R., Spain, Mexico, Japan, Australia, and India. The Chuquicamata

deposits in Chile, and those of Katanga on the tropical plateau are among the largest deposits in the world. Copper is one of Japan's chief metal products. Copper is also mined in the Balkan Peninsula and in Asia Minor. Other important regions of copper are in the Soviet Union, Canada, Peru, and China.

The principal copper deposits of India lie in Singhbhum and Hazaribagh of Bihar. The mining centres are located at Mosabani, Ghatsila, Thobani and Bedia of Singhbhum Hazaribagh of Bihar, the Khetri and Daribo areas of Rajasthan, and at Anantapur in Andhra Pradesh. Copper also occurs in Siwaliks (Uttar Pradesh) and in Karnataka.

### *Aluminium*

The light metal known as aluminium is comparatively a newcomer. It is the most modern of the common metals used in industry in large quantities.

The high thermal and electrical conductivity of aluminium and its light weight and corrosion resistance were the basis of the early large uses of this metal including the in the manufacture of cooking utensils and electrical conductors. Now it has become increasingly important as a structural material, particularly in transportation and architecture.

Aluminium is extracted from bauxite, cryolite, corundum and kaolin. Jamaica, France, Guyana, Surinam, Ghana, Hungary, Australia, and the United States produce bauxite, while cryolite is found only in Greenland. The world production of bauxite in 1974 was over 60 million metric tons, of which Jamaica contributed about 12 million metric tons. Surinam the second leading producer, raised a little over 6 million metric tons.

The United States with a production of about two million tons of bauxite has become the largest producer of aluminium and aluminium products in the world. The United

States imports about seventy per cent of the requirement of bauxite from Jamaica and Surinam.

France has long been the leading producer of bauxite. Other bauxite producing countries are Yugoslavia, Italy, Indonesia, Spain, and India.

About eighty per cent of the bauxite production is used in the extraction of aluminium. Conversion of bauxite into aluminium is done by electrolytic processes and hence heavy use of electric current is necessary. Most of the aluminium refineries are, therefore, located where cheap hydroelectricity is available. The great aluminium plants are located near powerful waterfalls such as those of Schaffhausen, Switzerland, and the Niagra Falls. Savoy in France and mountainous portion of Germany and Italy also possess aluminium factories. If power could be obtained cheaply enough, aluminium probably would be more widely used. Aluminium has, however, appreciably affected the stage of progress and the way of life of the people of the world.

In India, bauxite ore occurs in the Ranchi district of Bihar, in the Jabalpur and Katni districts of Madhya Pradesh, Kaira of Gujrat, Salem of Tamil Nadu, and Belgaum of Karnataka. About three-fourths of the total bauxite produced in India is consumed in the country and only a small quantity of this ore is exported to other countries.

### *Coal*

Coal was used for centuries to provide heat for domestic uses but in the late eighteenth century it was used to produce steam power and thus became the basis of the Industrial Revolution.

Coal was the most efficient fuel for steam raising, for driving factory machinery, and for use in railway locomotives, and steamships.

In the early part of the twentieth century

coal used to account for over 90 per cent of the world's power requirements, but by the 1960s this had dropped to only forty-five per cent. This decline is only relative because more and more coal is mined all the time. So rapid have been the expansion of power demands that other fuels have had to be used, and this has reduced the role of coal. It may well be that coal will one day cease to be an important fuel, but at the present time it is still very important. It also has tremendous historic importance in the location of industrial regions.

Apart from it being a source of power and energy, coal is also a source of valuable by-products viz., gases, tar, oils, pitches, coke, ammonia, fertilisers, synthetic dyes, benzol, naphtha, and numerous drugs. The carbon derived from coke is indispensable for steel.

Coal is formed by the partial decomposition of vegetal material. The vegetal material was the residue of the forest which grew luxuriantly in bogs, swampy and low-lying areas millions of years ago. Layers of sand, clay and silt, forming sedimentary rocks were laid down between the periods of plant growth. Where the process of decay was slow and incomplete owing to the lack of oxygen, forest deposits became peat which is the first stage in the formation of coal. The change of peat into coal was brought about by earth movements, when these layers of buried forests were subjected to tremendous compression to form coal seams. The coal seams are therefore found in sedimentary rocks and not in igneous or metamorphic rocks.

There are many types of coal which differ in their composition and content. On the basis of carbon content coal is classified under the following categories.

1. *Anthracite* : This is the best among all types of coal. It contains over ninety-two per cent carbon and is smokeless. Its colour is

black and lustrous. The flame is short and blue. The texture is hard and therefore mining cost is high and it cannot be ignited easily. Moreover, anthracite cannot be converted into coke. The main uses are domestic and central heating.

2. *Bituminous Coal* : This is a soft coal and contains about seventy per cent carbon. Its colour is black, the flame is medium to long and luminous and has little to medium smoke. It is used in coke manufacture, steam raising, bunker coal, and domestic heating. About eighty per cent of the world output is of this type.

3. *Lignite* : Lignite is also known as brown coal. It is a soft coal having a high percentage of moisture and much volatile matter. It gives out a lot of smoke but little heat. About fifteen per cent of the world's coal output is from lignite.

4. *Peat* : Peat is a brownish porous substance. It represents the first stage of coal formation and varies considerably in extent and thickness. It has a high percentage of moisture and volatile matter. Its low heating capacity reduces its value as an industrial fuel. It is mainly used for domestic purposes and it is sometimes used to generate electricity.

#### *Principal Coalfields of the World*

The principal coal producing countries of the world are the United States, U.S.S.R., China, West Germany, United Kingdom, France, Poland, Belgium, Australia and India (Fig. 4).

*The United States of America* : The United States occupy the first position among the coal producing countries of the world. Most of its coal is bituminous in quality. There are three important coalfields in the U.S.A. (i) The Appalachian Coalfields, (ii) The Rocky Coalfields, and (iii) The Interior Coalfields (Fig. 4).

The Appalachian Coalfields extend from

Pennsylvania to Alabama and contain the finest bituminous coal in the world. Pennsylvania, Ohio, West Virginia, Kentucky, Tennessee, and Alabama are the main coal producing

lyabinsk fields are the other main coalfields of Russia. The sparse population and vast empty lands of Siberia at first hindered coal development but today several industrial areas have

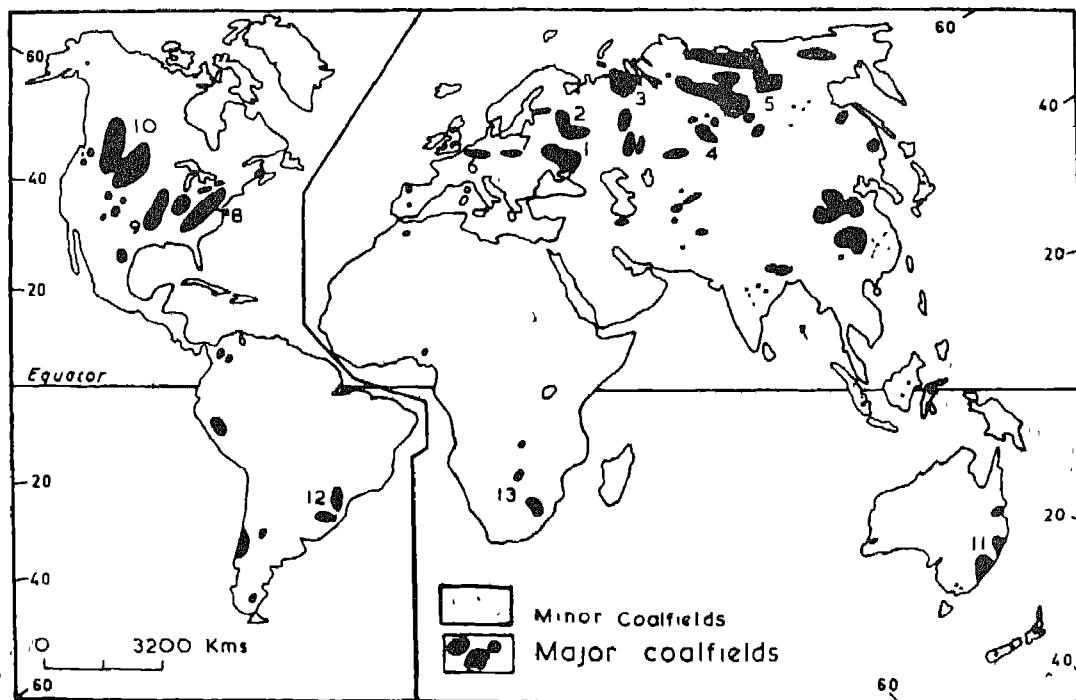


Fig. 4.

states of this area. The Rocky Coalfields stretch from Montana to the New Mexico State, while the Interior Coalfields lie in the States of Illinois and Indiana (Fig 4)

*The U.S.S.R* The Soviet Union is the second largest coal producer in the world, though its reserves amount to about sixty per cent of the world total. Coal is found in more than two hundred coalfields, the majority of which are in Asiatic U.S.S.R. The Donetz coalfield in the Ukraine is by far the most important. It provides coal and carbon to most of the industries of European U.S.S.R. The Kuznet, the Karaganda, the Moscow, the Pechora and the Kizel and Che-

been established in more accessible parts of Asiatic U.S.S.R. and these regions are growing in population.

*China* : China is the third important coal producing country in the world. All types of coal are found here, including anthracite, bituminous coal, and lignite. Though coal occurs in every province it is actively mined in Shansi, Shensi, Inner Mongolia, Kansu, Honan, Hopei, Shantung, Szechwan Basin, Yunnan, Kiangsi and Hunan.

*The United Kingdom* : The United Kingdom has very extensive deposits of coal, most of them of high quality. In Europe, coal was first exploited in Britain and during the nineteenth

century it was the leading producer of coal in the world. In Great Britain coal is mined at Durham, Newcastle, Northumberland, Yorkshire, Nottinghamshire, Derby, Lancashire, Cumberland, and South Wales (Cardiff and Swansea).

*West Germany* : Germany is by far the richest coal nation in continental Europe and its rapid industrial progress has been accomplished with the extensive exploitation of coal. Most of West Germany's coal is bituminous but lignite deposits are also worked. The major coalfields are in the Ruhr Basin, Westphalia, Saxony, Silesia, and Bavaria. These coalfields are well served with cheap inland waterways and rail transport.

*Poland* : Poland has large coal deposits, mainly bituminous in the Upper and Lower Silesian coalfields. The coal is supplied to the Silesian industrial complex of Poland.

*India* : The main coalfields of India are situated in the Damodar Valley in the States of West Bengal, Bihar, and Orissa. The main mining centres are at Raniganj, Jharia, Bokaro, and Giridih. The Damodar Valley accounts for over ninety per cent of India's annual output. Lignite coal is mined at Bikaner, South Arcot and in Kashmir. In Madhya Pradesh coal is obtained from the mines of Shohagpur and Umaria. Maharashtra has coal deposits in the Wardha Valley. Much of the coal is used by the iron and steel works at Jamshedpur, Rourkela, Bhilai, and Durgapur. Coal mining in India is done mainly by cheap hand labour and is of low efficiency.

The other coal producing countries are Canada, South Africa, Czechoslovakia, Australia, Belgium, Japan, Spain, the Netherlands, Iran, Chile, and New Zealand.

### *Petroleum*

Although petroleum has been known from early times, its use for light, heat and power did not begin until about 1860. The

invention of internal combustion and compression ignition engines is responsible for the use of petroleum as a major source of energy. The motor car and the aircraft, which from the earliest stages used great quantities of petrol, were the first extensive users of oil products. Now, besides motor, aircrafts, and ships, petroleum is used in railways and industries.

A peculiar feature of oil is that it is used very far from the places in which it is extracted. It is more precious and far more easily transported. Oil has given rise to bigger tankers and pipelines. Some of the pipelines are trans-continental. Their construction is reckoned among the greatest achievements of modern engineering.

Oil has a wide range of uses in industry, commerce, agriculture and other fields and has contributed greatly to the world's industrial development. It serves as a fuel, a lubricant, an illuminant and as a raw material for a wide range of products. Its by-products are used in the chemical, pharmaceutical, textile and many other industries.

### *Principal Oilfields*

The distribution of oil reserves is quite uneven in the world. The leading petroleum producing countries in the world are the United States, the U.S.S.R., Venezuela, Kuwait, Saudi Arabia, Iran, Iraq, Libya, Nigeria, the Gulf States, and India (Fig. 5).

*The United States* : The first oil-well was drilled in 1859 at Titusville (Pennsylvania) where this valuable resource was rapidly exploited. The United States have been by far the greatest oil producing country for more than a century. At one time the U.S.A. accounted for 90 per cent of the world production but as other oilfields in the Middle Eastern countries, in the U.S.S.R., in Venezuela and elsewhere were brought into production, U.S.A.'s market share dropped to about

twenty five per cent.

Oil occurs in many parts of the U.S.A (Fig. 5), but there are five major oil-regions: the Mid-Continent region of northern Texas, Oklahoma and Kansas, the Gulf Coast region of southern Texas, Louisiana, Mississippi and

world production. The traditional oil producing region is around the shores of the Caspian Sea. The principal oilfields are to the South-East of the European U.S.S.R. The Baku field on the West coast of the Caspian Sea and several fields along the north flank of the

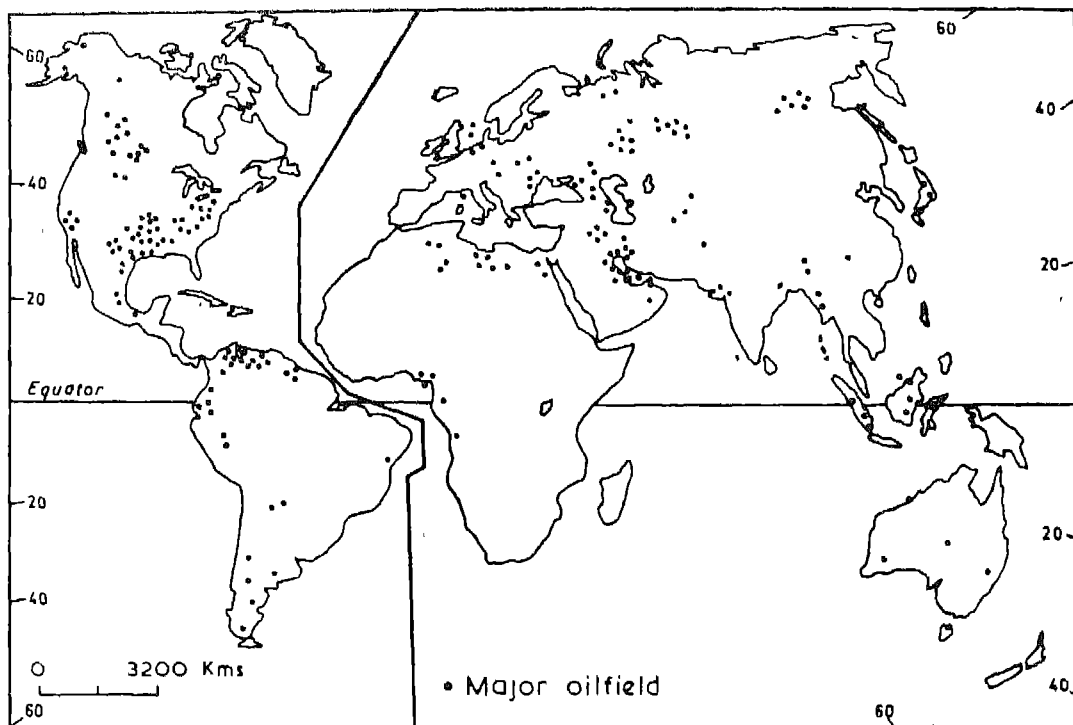


Fig. 5.

Arkansas; the Rocky Mountain region of Wyoming, Colorado, Montana and New Mexico; The southern California; and the Appalachian region of Pennsylvania, Kentucky and Ohio. Smaller fields occur in Indiana, Illinois and Michigan and there are large reserves in Alaska. In the U.S.A. oil is distributed by a dense network of pipelines which carry crude oil and gas and are about 160,000 km. in length.

*The U.S.S.R.:* The Soviet Union is the second largest producer of oil in the world, accounting for nearly fifteen per cent of the

Caucasus Mountains are especially important. To the north of the Caspian Sea the Grozny and Maikop fields are important. Recently, vast new reserves were discovered between the Volga and the Urals and the region became known as the 'second Baku'. In this region the main fields are around Ufa, Perm, Kuybyshev, Molotov and Saratov. The wells are of medium depth and yield both light and heavy oils. More recently, still large reserves have been found in Asian U.S.S.R. These include fields in Turkestan (Fergana Valley), the Emba, and Nebit-Dagh fields to the East.

of the Caspian Sea and the important fields in the Tyumen and Tomsk region.

Most of the oil is refined in the drilling regions at Baku, Grozny, Perm, Ufa and Kuybyshev, and a vast network of pipelines transport oil to most parts of Western U.S.S.R. Soviet Union exports oil by pipelines to Hungary, Czechoslovakia, East Germany, and Italy.

*Venezuela* : Venezuela is the leading oil producing country in South America. It leads the world in oil exports. The Gulf of Maracibo, the first area to be exploited, is still the leading oil region of Venezuela. Oil is also found inland of Puerto la Cruz, in the Llanos and the Orinoco Delta. Most of the oil is exported to North America and Europe.

*The Middle East* . The Middle Eastern countries together produce over twenty-five per cent of the world's petroleum. The major oil producing countries are Kuwait, Saudi Arabia, Iran, Iraq, Abu Dhabi, Qatar, Bahrain and Dubai. The technological backwardness of most of the Middle Eastern countries, combined with their small populations, has meant that international companies have been largely responsible for exploiting the oil reserves, while the various governments have drawn rich royalties. The transport of oil by tankers or pipelines as well as a number of important refineries in the Middle East are also run by the oil companies. The major pipelines run from the inland fields or fields on the Persian Gulf to the Mediterranean coast.

Saudi Arabia has about ten per cent of the world's reserves of oil. The oil producing areas of Saudi Arabia are those of Dhahran, Abqaiq and Ghawar. A refinery has been built at Dhahran. The bulk of the crude oil is, however, sent to large refineries at Bahrain and the port of Sidon in the Lebanon on the Mediterranean Sea.

Iranian oil was first tapped in 1913.

The principal oilfields of Iran are in the South-Western parts of the country around Khazistan. Masjid-Sulaiman, Naft-i-Shah, Lali, Agha Jari, Gach Saran and Bahregan are the main oil producing centres. Oil is piped to refineries at Abadan on the Persian Gulf, and to Kermanshah. Both crude oil and petroleum products are exported.

In Iraq oilfields are situated at Baba-Gaur, a few miles north of Kirkuk, the South-West flank of the Kurdistan Mountains. Oil from this field is sent by a pipeline to the Mediterranean ports of Banias, Syria, and Tripoli. Mosul in the north also has some oilfields.

Other important producers in the Middle East are Kuwait, Bahrain, Qatar, Abu Dhabi and Dubai.

*India* . India has some reserves of oil and output has increased rapidly in recent years. The major oil producing areas of India are Assam, Bombay High and Gujarat. Oil reserves are likely to be found in Tripura, the West Bengal Basin, the Ganga Valley, Andhra, Tamil Nadu, and Kerala coasts, and the islands of Andaman and Nicobar.

Oil is also produced in Canada, Indonesia, Mexico, Algeria, Libya, Egypt, Argentina, Rumania, West Germany, Yugoslavia, the Netherlands, France, Japan, Australia and New Zealand.

#### *Uranium*

Uranium is a dense, hard, radioactive, nickel-white metal with the highest atomic weight. Compounds of Uranium are present in the rocks of varying composition and origin. The actual composition of Uranium in most of the rocks is, however, low and ore bodies suitable for economic exploitation are rare.

Although the quantity of Uranium produced in each country is a military secret, the most important uranium ore is found in Zaire (Africa) and in the Witwaters and region of South Africa. There are two mines in North-

East Canada, one in the vicinity of the Great Bear Lakes and the other near the Athavaska in the province of Ontario. The Erz mountains on the boundary between East Germany and Czechoslovakia also contain rich deposits of Uranium. Uranium is extensively found in the U.S.S.R. at Tuya-Mayun, Majil-Say, and in the Baikal region. India's present overall indicated and inferred reserves of Uranium are estimated at about 76,000 tons. Singhbhum in Bihar has Uranium deposits of great economic importance. Uranium has also been discovered in the Himalayan regions of Himachal Pradesh and Uttar Pradesh.

Uranium is a compound form of fuels for nuclear reactors, principally for the generation of electricity. Efforts to find outlets for Uranium outside the nuclear technology have met with very little success, because it is more dense than lead. It has, however, replaced lead for some X-ray and Gamma-ray. The production of Uranium in 1972 was about 25,000 tons, of which fifty per cent came from the United States and about twenty per cent from Canada.

### *Thorium*

Thorium is a heavy gray metal, slightly malleable and ductile. It is magnetic and radioactive. It turns gray or black when exposed to air.

With the discovery that thorium can be used as a source of nuclear energy, its occurrence and distribution on the earth's surface has assumed greater economic importance. Although thorium is found in several different minerals, it can be recovered most economically from monazite. This is a mixture of rare earth and thorium phosphates which occur in sands in India, Brazil, and to a lesser extent in the United States.

In India the monazite sands of Travancore contain thorium. The total reserves of rare earth-oxides in the beach sands of India have

been estimated at nearly one million tons. Thorium deposits of the United States are found in Idaho, Colorado, and North Carolina.

It has been estimated that the world reserves of thorium are about one million tons. The energy obtainable from this amount of thorium is expected to be about the same as the energy obtainable from the world's known reserves of coal and petroleum.

### *Water as a Resource*

Water is man's greatly used and indispensable natural resource. It is an important factor in our daily lives, in agriculture, in industry and in recreation. Among its industrial uses are: its direct application in washing and mixing with chemicals, in producing steam, and in refrigerating and the most important of all, in generating electric power. Water plays an important role in transportation—both ocean and inland—and is also important to the millions of people who depend on it for irrigation.

Running water from streams, rivers, and melting glaciers has long been utilised by men as a source of power for grinding flour or sawing logs. Primitive water wheels have been placed in swift-flowing streams, at rapids or waterfalls, to generate power since the earliest times. The invention of the hydro-turbine, dynamo and cement have, however, allowed water power to be used to generate electricity and thus enhanced the importance of water as a source of power which had previously been overshadowed by the use of mineral fuels.

Hydroelectricity or 'white coal' is a great source of energy. It is never exhausted and it regenerates itself naturally. Although the catchment works, dams and headpipes are very expensive, but apart from that the capital required and the running expenses are very small, for not much labour is used in power-houses, where automatic working is

carried even further than in oil refining. Hydroelectricity has enabled countries without coal to become industrial and it has added to the power of countries which did not produce enough coal for their factories. Scandinavia, Switzerland and Italy have been able to become great industrial countries by its use. Canada, Japan, Australia, Congo, and Brazil are largely dependent on hydroelectric power for fuel for their industries.

Two conditions determine the distribution

of lakes. A host of such lakes of every size strew the ground in Finland, Scandinavia, and North America (Fig. 6). Other regions that produce hydroelectricity are high mountain areas in which slopes are steep and rainfall heavy. In high mountains like the Alps, the Himalayas, the Rockies, the Andes, and the Western Ghats (India), variations in level may amount to few hundred metres and in places exceed 1,000 metres. Unfortunately, the harnessing of water in high mountains demands enor-

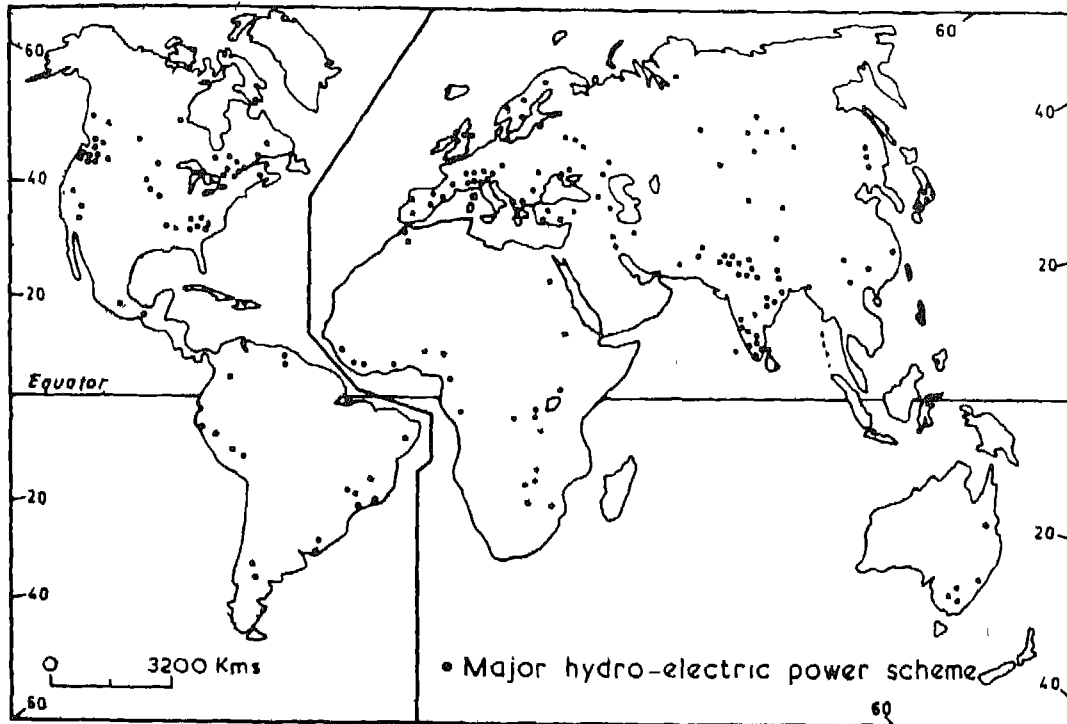


Fig. 6.

of water powers i.e., an abundant and regular flow of water, and the presence of slopes, steep enough to cause natural waterfalls. Several geographical regions afford these conditions. In the Northern Hemisphere there are regions which have damp climates with plenty of rain to feed a dense network of streams and they have natural reservoirs in the shape

of lakes. A host of such lakes of every size strew the ground in Finland, Scandinavia, and North America (Fig. 6). Other regions that produce hydroelectricity are high mountain areas in which slopes are steep and rainfall heavy.

In high mountains like the Alps, the Himalayas, the Rockies, the Andes, and the Western Ghats (India), variations in level may amount to few hundred metres and in places exceed 1,000 metres. Unfortunately, the harnessing of water in high mountains demands enormous engineering works which can only be undertaken by countries with a very high level of technique.

Another kind of region favourable to the production of hydroelectricity is the great river plain with its low gradient and enormous volume. Here also long dams are needed to raise the water level, make the flow regular,

and form an artificial fall. Hence, there has been little harnessing of big rivers in the developing countries. The Victoria Falls on the Zambezi, the Congo in Katanga and the Niger river still do not yield power. Large constructions undertaken after the Second World War have turned the Rhone and the Rhine into great producers of electricity. Similar constructions are being made on the Danube in Germany and in Austria. In the Soviet Union, the Dnieper and the Don work huge electricity generators, while the Russians are busy harnessing the Volga and some of the big rivers in Asia. In the United States there is a big dam on the Mississippi at Keokuk, and the Missouri while in the plateaus of the west, the Hoover Dam on the Colorado and the Coulee Dam on the Columbia are among the greatest concrete structures in the world.

India has an immense potential of water-power and great possibilities to develop it. The great difficulty, however, lies in the fact that rainfall in India is seasonal and, therefore,

construction of costly reservoirs is necessary for the development of hydroelectric power. India's major water potentials lie in the Himalayan Mountains, North-Eastern Hills and the Western Ghats. The major multi-purpose projects constructed after independence are the Bhakra Nangal Dam (the Punjab), Hirakud (Orissa), the Damodar Valley (West Bengal), the Kosi Project (Bihar), the Koyna (Maharashtra) and the Rihand (Uttar Pradesh). Many other important projects are in various stages of completion.

The introduction of hydroelectricity as a source of power has influenced the location of industries in the mountain areas. Moreover, it has checked the tendency to industrial concentration due to coal and petroleum. Owing to the transmission current along high tension wires industrial regions have spread out, reviving craftsmanship and cottage industry. However, hydroelectricity does not promise to replace coal for all purposes or wholly to relieve congestion in the great industrial centres inherited from the last century.

## EXERCISES

### Review Questions

1. Give a geographical distribution of the forest resources of the world.
2. What are the main reasons for forest depletion? What practices can be adopted to overcome this problem?
3. Describe the world distribution of coniferous forests.
4. With the aid of a world map, locate the major areas that are important for temperate and tropical woods.
5. Describe the major fishing grounds of the world and their influence on the occupation of the neighbouring peoples.
6. Select two areas that specialise in fishing. Outline the geographical advantages that each enjoys.

7. Explain the following:
  - (i) Japan has a high per capita consumption of fish,
  - (ii) There is lack of fishing grounds in the tropical latitudes.
8. Make a comparative study of large-scale commercial fishing in the North-West Pacific and the North-West Atlantic.
9. Why is mining referred to as a 'robber industry'? What minerals are most likely to be exhausted in the near future and what conservation measures may be taken to prolong their economic life ?
10. Describe the uses of each of the following metals: (a) iron, (b) copper, (c) aluminium, (d) uranium, (e) thorium.
11. On a sketch map of the world locate the following coalfields :
  - (a) the Damodar Valley Coalfield;
  - (b) the Northumberland Coalfield,
  - (c) the Pennsylvania Coalfield,
  - (d) the Donetz Coalfield.
12. Explain any four of the following terms used in connection with the geography of coal:
  - (a) bituminous, (b) volatile matter, (c) lignite, (d) coking coal.
13. Discuss the location of large industrial areas in either Europe or North America that are related to coalfields.
14. 'Coal is the fuel of the past, petroleum of the present, and electricity of the future.' Discuss.
15. Describe and account for the world's uneven distribution of hydro power

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## Natural Resource-Based Production Complexes and Conservation of Resources

### PRODUCTION COMPLEXES

Manufacturing is an essential activity of man. Hundreds and millions of people depend on it for food, shelter, clothing, tools, and luxuries. Manufacturing of goods is done in households, in small factories, and in the complex modern factories. The raw material based industrial complex is a new term in industrial geography, coined and applied by the Russian geographers of the last decade. The Russians looking at the vast resource potentials of the U.S.S.R., thought it more judicious and rational to establish industries on the basis of raw materials available for an integrated and balanced development of the different parts of the country. Though the term, resource-based territorial complex has been given a new dimension by the Russians in recent years and most of the planners are paying attention to such complexes, many of the industries of the past have however, also been located, considering the factor of raw materials availability. In the following pages some of the important raw material based territorial complexes have been described. (Fig. 7)

### Production Complexes of Europe

In Europe, production complexes are

usually located near minerals, forests, agricultural, and power resources. In Sweden, the availability of timber has encouraged the location of furniture, paper, pulp, and chemical industries. In Britain most of the industrial complexes are very closely associated with coalfields. The West German production complexes are more concentrated in the Rhur Valley, while in France the North-Eastern region, Lorraine, and Greater Paris have the major production complexes, based on iron ore metallurgy, chemical, agricultural, and forest raw materials.

Among the other major producing centres of Europe are Liege and Antwerp (Belgium), Amsterdam in the Netherlands, and Stockholm in Sweden. The leading industries of Norway are based on iron, sea and forest products consisting of shipbuilding, fish-canning, and pulp and paper industries, which are confined mostly to and around Oslo. The dairying, agricultural equipment, and chemical industries of Denmark are centralised at Copenhagen. In the Swiss Plateau the major industries are those of watch-making, electrical engineering, chemicals, and textiles. In Italy the industries are mainly concentrated in the plains of Lombardy in the north and at Naples in the south. The industrial complexes

of Poland are near the Silesian Coalfields and Warsaw which use the agricultural, forest, and mineral resources of the neighbourhood

### Production Complexes of North America

United States and Canada are highly

industrialised towns; (4) the Detroit production complex, specialising in automobiles, wagons and cars, (5) the Lake Michigan industrial complex in which Chicago has the iron and steel plants and meat packing industries, and (6) the Southern Appalachian production complex

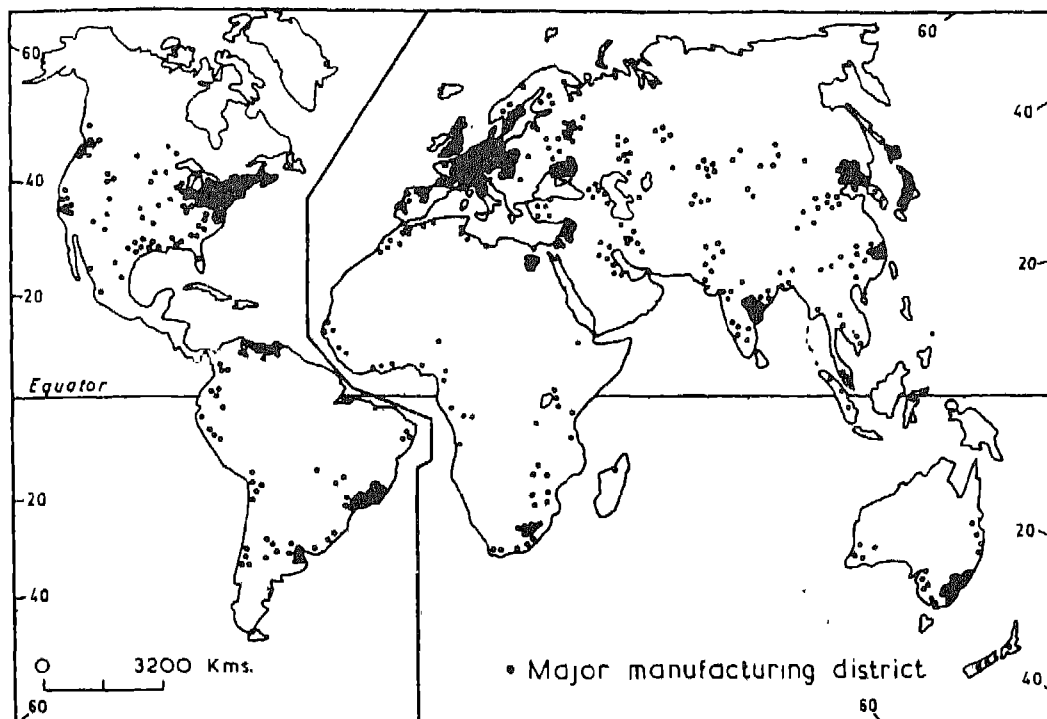


Fig. 7

industrialised, having many natural resource-based industrial complexes. The United States is rich in fuel, minerals, forest, agricultural land, and sea resources. The major production complexes of the U.S.A. are six, namely: (1) the New England producing textiles, footwear, fish-canning, and shipbuilding; (2) the Mid-Atlantic States, comprising the complexes of New York, Philadelphia and Baltimore. In this region there are diverse industries, ranging from metallurgical to chemical electrical and food-processing, (3) the Pittsburgh Lake Region has a chain of steel and engineer-

ing towns; (4) the Detroit production complex, specialising in automobiles, wagons and cars, (5) the Lake Michigan industrial complex in which Chicago has the iron and steel plants and meat packing industries, and (6) the Southern Appalachian production complex

at Birmingham. Around the city of Birmingham owing to the availability of coal imported as fuels, and iron ore, cotton and cereals, as raw materials, the iron and steel, cotton textiles, and food processing industries are concentrated. In Canada the main industrial complexes stretch between the Lake Peninsula and Montreal. In this region saw-mills, pulp and paper making, engineering, automobiles, fertilisers, cement, shipbuilding, food processing, oil-refining, railway engineering, and textiles are the important industries. The availability

of cheap hydro-electricity, iron ore, agricultural products, and softwood from the coniferous forests helped in the development of the Canadian production complex.

### **Production Complexes of the U S S R.**

The production complexes of the Soviet Union are concentrated in four major areas, namely (1) the Moscow Region; (2) the Ukrain-industrial Region; (3) the Ural Industrial Region; and (4) the Kuzbas or Kuznet Region.

The Moscow industrial complex is the oldest industrial region of the U.S.S.R. It includes the cities of Moscow, Gorki, and Tula. It produces textiles, diverse machines, chemicals, heavy engineering, steel plants, railway equipments, automobiles, aircrafts, and food processing. In the Donetz or Donbas area of the Ukraine there are many large industrial centres which make iron and steel, heavy machinery, and chemicals as well as smelting a wide range of ferrous and non-ferrous metals. The Urals main production complexes consist of steel mills, metallurgical industries, heavy machine-building, chemicals, and oil-refineries. The raw materials for these industries are locally available from the Ural mountains and the coal and coking coal is imported from the Kuznet Basin and Karaganda. In the Kuznet or Kuzbas Complex, the major industries are those of iron and steel, metallurgy, engineering, and chemicals.

### **Production Complexes of Asia**

Despite its large size and rich agricultural, forest, sea, and mineral resources, Asia has less natural resource-based complexes. Japan, Hong Kong, Korea, and Taiwan are the only countries of Asia in which industrial complexes are vast and varied. China has developed industrial complexes rapidly during the last twenty years. Japan is an important industrial

country of the world but its industries are mostly based on imported raw materials. The industrial belt of Japan stretching over the South-Eastern parts of Honshu and Northern parts of Kyushu, and Shikoku around the inland sea of Japan produces a great variety of machines, textiles, electric goods, perfumes, toys, paper, pulp, fish-canning, food-processing, shipbuilding, and light machines. Japan, being poor in iron ore has to depend on the import of ferrous-minerals. Cheap hydro-electricity, skilled labour, and favourable location are the factors responsible for the development of production complexes of Japan. In the South-East Asia, Singapore is highly industrialised and in recent years industrial complexes have been coming up in Malaya and Indonesia as well. In the Middle East oil refining is an important industry. Iran on the basis of oil is attempting to establish a chemical and industrial base in the South-Western side of the country around the oil fields of Masjid-e-Sulaiman and Safid.

After independence, India has also laid down a strong foundation for iron and steel, chemical, and electrical industries, while cotton textiles have an old base in the industrial history of India. Besides, West Bengal, Bihar, Gujarat, and Maharashtra, the North-Eastern Hill states of India have vast potentials of varied raw materials which need to be used for the territorial complexes. Many territorial complexes are emerging in various parts of the country. The Damodar Valley is India's most important coal mining and iron and steel producing complex. The iron ore deposits of Singhbhum, bauxite, copper, and mica resources of the Chhota-Nagpur Plateau have helped in the development and concentration of industries of Jamshedpur and in the Damodar Valley. The production complexes around Bombay are dependent on raw materials derived from agricultural and from

chemicals. Raw cotton of the North-West Deccan cotton fields serves as a raw material for the cotton textiles of Bombay. There are many smaller industries producing brassware, silver-ware, jewellery, ornamental ivory, carpets, and handicrafts. In the Calcutta-Howrah area there are more than one hundred jute factories along the bank of Hoogly.

### **Production Complexes of the Southern Continents**

Australia, Africa, and South America have a few large industrial complexes. In these countries, agriculture and primary extractive industries, especially mining, are more important than manufacturing industries.

In Australia the main production complex is in the South-East. Around Sydney, the presence of coal and iron resources led to the establishment of iron and steel industries at Newcastle. There are also industries manufacturing cars, locomotives, aircraft, chemicals and building-ships. Melbourne has chemicals, automobiles, and railway equipments, while at Perth, agro-industries are important. In South America only parts of Argentina and Brazil have production complexes. In Argentina the main industrial complex along the Plate Estuary manufactures textiles, meat-packing, dairy products, food processing, steel, engineering, automobiles, and chemical plants. In Brazil, Sao Paulo and Rio-de-Janeiro have steel mills, chemical plants, motor vehicles assembly plants, paper, cement, ship and aircraft building industries.

Africa is the least developed and has very few production complexes. The main industries of Africa are those connected with either mining or agriculture e.g., smelting of copper in Zambia and Katanga and processing of rubber and oil-palm fruits. South Africa is the most industrially developed country. It has gold, coal, and iron ore resources on the basis of

which iron and steel, engineering locomotives, chemicals, textiles, and light machine industries have been established. Nigeria has petrochemical industries owing to the fact that it is rich in mineral oil. Elsewhere in Africa industrial development is confined only to the capitals and ports.

### **CONSERVATION OF RESOURCES**

Over the years conservation has acquired many connotations. To some people it has meant the protection of wild nature apart from man; to others it means the sustained production of useful materials from fisheries, forests, agricultural lands, to power and mineral resources. But now conservation of resources means the rational utilisation of environment to provide the highest sustainable quality of living for mankind. Thus conservation does not mean that we are not to use the available resources but rather that we are to use them wisely and not waste them immediately or in a short time.

### **Importance of Conservation**

Conservation of resources is essential for the survival of man. Because life depends on air, water, soil, rocks, forests, and waterbodies, the ultimate purpose of conservation is to maintain all these in a healthy operating condition. Conservation of resources has, therefore, economic, aesthetic, and scientific value for mankind.

### **Ancient Conservation Practices**

Certain conservation practices have been developed and adopted from the earliest times of human civilisation. Some species of animals were protected by religious taboos. Religious sanctions prevented the destruction of forests, groves, sacred rocks, and mountains. Early civilisations developed good techniques of terracing to prevent soil erosion on hill sides.

and to make more effective use of water for irrigation. As civilisation progressed and developed, human experiences led to increasingly sound land use practices and protection of wild animals and forests. The agricultural landscapes in India, Japan and China—especially in the hilly areas,—reflect the great skill in conservation of soil resources. Irrigated land in the Nile Valley, alluvial soils in the Great Plains of India and the lava soils in Maharashtra have been kept fertile and productive over thousands of years by the sustained and skilled efforts of men.

### Recent History of Conservation

The recent history of conservation of natural resources has been marked by a great expansion of government role in protecting the environment and by a growth of public interest in conservation. For the conservation of resources and for a much more integrated approach to environmental problems, many countries have established ministries. The principal resources that need conservation and suitable management are soil, water, forest, wildlife (birds, fish, and animals), power resources, metallic and non-metallic minerals, recreational resources, and the life of the people.

### Conservation of soil

Soils are the basis of support for most life, and a source of nutrients for marine life and fresh water. Soils vary from place to place, depending upon the rocks and minerals from which they are derived, the local climate and the animals and plants live in or on them. Soils are essential for man for growing crops, fodder, and timber. It is, therefore, important that they should not be allowed to wash or blow-away more rapidly than they can be regenerated, their fertility should not be exhausted, and their physical structures should

remain suited to continued production of desired plant materials. The objective of soil management is, therefore, to keep soil in place and in a state favourable to its highest productive capacity.

There are a number of physical and cultural factors responsible for the depletion and erosion of soil. Slopes, rainfall, weather, temperature, wind, snowfall, and man's action like deforestation, overgrazing, and unscientific cultivation, etc. Once the fertile portion of the earth surface is lost, it is very difficult to replace it. In extreme cases, soil erosion leads to the formation of deep gullies that cut into the soil and then spread and grow until all the soil is removed from the sloping ground. To check soil erosion and to improve soil fertility, various methods have been practised in different parts of the world. Some of the important methods of soil conserving are to control excessive grazing, rotating of crops, cultivation of short duration cover crops, control of shifting cultivation, and to restore gully plugging. Soil erosion on sloping ground can be prevented by terracing on steep slopes or by contour cultivation on gentle slopes. To prevent wind erosion, shelter belts of trees are to be planted to break the force of the wind. Ploughing of land at right angles to the direction of wind further serves to prevent wind erosion.

Although measures to stop soil erosion are now widely used in the developed countries, the problem remains a major one in the developing and the underdeveloped countries of the world. Soil erosion is particularly severe in the tropics, where heavy rainfall and steep sloping ground favour the rapid loss of any soil exposed by agriculture, and around the edges of the world deserts. Planned programme for soil conservation, if undertaken by a government, can help a long way in this direction.

### Conservation of Water and Air

Man requires water for a variety of purposes. There is a steadily growing need of water supply for drinking, for domestic animals, plants, irrigation, industries, transportation, cleaning, sewage disposal, and for the generation of electricity. Its conservation and management are, therefore, essential for the survival of the human race, plants, and animal life. The requisites of a good water supply are that it should be free from mud, taste, smell, chemical impurities, and injurious bacteria. Most of the governments and local governments are trying to provide good quality water to their people, but there is still much left to be done in the rural areas of Afro-Asian and Latin American countries.

The scientists' concern about the quality of air is a relatively recent development. Air pollution results from a variety of causes, not all of which are man's responsibility. Dust storms in the desert areas and smoke from forests and grass lands contribute to chemical and particulate pollution of the air. Air pollution on urban atmosphere is noticeable and causes great public reaction. The task of removing air pollution, although difficult, is not insurmountable. Apart from government it is the duty of each of us to minimise air pollution.

### Conservation of forests

With the rapid increase in the demand for timbers, fuel-wood, paper, pulp in construction industry, and synthetic fibres in the world, forests have been exploited rapidly. Besides the misuse of forests by man there are other factors like fire, insects, disease, and wind-storm which are also responsible for forest depletion to a great extent.

Recently the importance of forests has been realised and different scientific policies have been adopted in different countries to stop the

exploitation and destruction of forests, and to attain the maximum possible satisfaction from the forests by making their use rational and by conserving them. One of the greatest enemies of forests is forest-fire. Each year forest-fires sweep over large areas. This great waste can be, almost wholly prevented if adequate attention is given to safeguarding the forests from fire. Many fires are due to sparks from locomotive, lumber mills, carelessness of hunters, and picnickers. Most of these can be prevented if proper care is exercised. In dry seasons hunters and idle visitors should be forbidden to enter the forest. The burning of forest waste should be done after a heavy rain or snow fall when the danger of conflagration is much less.

Another way of conserving forests is the prevention of waste in lumbering and in preparing the lumber for use. Still at many places much of the waste material is burned which can be used for fuel and some in making small articles like toys, laths, and handles for tools. More attention is to be given to the treatment of lumber with chemicals to prevent decay and destruction by insects. Large-scale afforestation is also necessary for the conservation of forests to provide the benefits to future generation.

In India as in many parts of the world, misuse of vegetal cover leads to disastrous results. Rajasthan is largely a man-made desert. Most of our Sahadris are now poor and dry. Much of the Central Maharashtra has been transformed from a natural grassland to scrubland due to overgrazing, extensive tilling of land during good years and abandoning it during bad years. According to experts, every country should have at least one-third of its total land under forests as there is a well known saying 'After man the desert'.

### Conservation of Wildlife and Fishes

Wildlife and fisheries have contributed appreciably to the human progress and civilisation. At present in the Age of Machines we cannot do without cattle. Many species of animals have been extinguished from the earth and many have been reduced in number only because the ecological system and locale have been changed by man. In tropical and sub-tropical semi-arid areas, Mediterranean countries and West Asia, there has been over-grazing. In the developed countries of Europe, America, Australia, and New Zealand, cattle are well taken care of and the quality of the grassland or pasture is not allowed to deteriorate. Our country needs better and well nourished breeds in place of the present thin, undernourished stocks. Wild animals like deer, lion, tiger, elephant, and various types of birds also need protection and conservation. This can be done by closed seasons when they cannot be hunted.

Fisheries include catching of fish and gathering of shells and mammals like the whale and the seal. Fisheries at present are contributing to the food resources of the world and their conservation is, therefore, very important for our use and for the future. Moreover, increased productivity in fisheries may contribute to the commercial harvest, raising the income and standard of the people dependent on them. The problems of fisheries conservation are, however, numerous. It is essential first to locate the fish and to derive some estimate of their abundance. It is also necessary to determine the maximum sustained yield of fish population. Moreover, there should be supervision and control over fisheries, and the ecological requirements of the fishing grounds should not be disturbed and polluted.

### Conservation of Mineral Resources

Minerals, more than forests need to be

carefully conserved. Forests are renewable and can grow again but minerals once dissipated can never be replaced except over long periods of geological time—which extends over millions of years. The exploitation and conservation of mineral resources depends on the stage of culture and technological advances, price of mineral, the location of mineral ore with reference to transportation and market, the ease of exploitation, the policies of the government, the richness of the ore, the depth of the ore-body, climate, and labour cost.

### Conservation of Coal

The utilisation and exploitation of coal has been going on for a long time. Coal supply is, however, limited and there is no way of replacing it. Coal can be saved by more careful and scientific methods of mining. Now more electricity used for light and power is being generated by water power. The use of hydro-electricity should be increased to save coal and therefore many more rivers should be harnessed.

### Conservation of Petroleum

It is not easy to say how long the world's petroleum supplies will last. All the experts of petroleum are of the opinion that with the rapid increase in consumption it is not going to last as long as coal. The length of time it will last is probably a matter of decades rather than centuries. What then can be done to save as much petroleum as possible for future use? A great deal of waste of petroleum takes place in the oil fields. More oil is taken from the earth than is really needed. Each owner is probably eager to turn his oil into cash. Owners perhaps fear that if they do not drain the oil from their own wells, it may flow into the wells of the other owners nearby.

In the early days of the petroleum industry

the hit or miss method was used. A well was drilled and, if oil was found, the owner was lucky. Now geologists study regions with great care and give close attention to the kind of rock through which the drill passes. With the help of experts oil deposits are much more readily located. Oil is also saved if the owners of a well in a region agree to draw the oil slowly and maintain the pressure in all the wells. If this is not done much oil remains in the earth and is lost. Methods of refining also offer opportunities for saving oil supplies. Petrol is the one product of petroleum for which there is a great demand. Refiners are seeking methods of obtaining more Petrol from a given amount of crude oil. As oil reserves are limited we should be obliged to look elsewhere for sources of liquid fuel. Rocks known as oil-shale of which the world has large resources, contain much oil. These rocks when subjected to varying degrees of heat, yield the various products now derived from liquid petroleum. Such products, however, are not so cheap as when obtained directly from crude oil. Leading experts of petroleum believe that all the oil we need for 2000 years can be obtained from our reserves of coal at a cost not much greater than we are now paying.

#### Conservation of Iron Ore

Ours is an Iron Age in which we cannot live without using vast quantities of iron.

This metal differs from coal and petroleum because it can be used more than once. Old bridges, locomotives, steel ships, automobiles and many other iron products yield large quantities of iron which can be used again. The junkman by gathering up iron waste helps to make our supply of iron last longer. Japan, Italy and some other countries which are poor in iron ore, import scrap iron for their heavy machine industries. Rust is the great enemy of iron. The prevention of rust seems to be the best means of conserving our supplies of iron and steel. Similarly all the minerals, metallic or non-metallic are to be conserved.

#### Conservation of Human Resources

The greatest resource of a country is its people. The health and education of citizens is of far more importance than land, soil, forests, water, mineral and power resources. Ill health brings sufferings, loss of employment, poor efficiency and expenses. In cases of severe epidemic a whole region may be affected adversely. Ordinary duties cannot be performed by people with poor health. One of the best methods to conserve it is by a proper and balanced diet. It has been found that cleanliness brings health. Sewage and other waste must be properly disposed of. Water, food, and air must be kept pure. A sustained growth rate of population can increase the standard of living of the people which will ultimately increase man's health and efficiency.

## EXERCISES

### Review Questions

1. Answer the following questions briefly :

- (i) Give the causes for the location of the major raw-material-based complexes of Europe, North America, the U.S.S.R. and Japan.

- (ii) Give the reasons for the main territorial complexes of the U.S.S.R.
  - (iii) State the major industrial complexes of India, and China and give the causes of their development.
  - (iv) State the major industrial complexes of S.W. Asia and the raw materials used in them.
2. The following are some of the important territorial areas of the world :
    - (i) The Pittsburgh-Erie Industrial Region; (ii) The Greater London Industrial Region;
    - (iii) The Osaka-Kyoto Industrial Region ; (iv) The Hoogly Industrial Region.
 Relate the industrial growth of these areas to the availability of raw materials, power resources and markets.
  3. What is conservation of resources ? Give the methods adopted by ancient man for the conservation of resources.
  4. Give the causes of
    - (i) Soil erosion
    - (ii) Depletion of forests
    - (iii) Depletion of fishing grounds
    - (iv) Robbery of minerals
    - (v) Petroleum is not going to last long
    - (vi) Ill-health of people of a nation results in poor standards of living.
    - (vii) Explain the proverb "After man the desert."
  5. Discuss the various methods necessary for the conservation of coal and petroleum.
  6. Describe the methods to be adopted for the conservation of fisheries and wildlife.
  7. Suggest suitable methods for the conservation of forests.
  8. What are the chief causes of forest depletion ? Discuss the nature and problems of forest conservation.

#### Find out

1. Find out the major steps taken for the conservation of soils and forests in your neighbouring areas.
2. Visit an industrial area and find out the raw materials used in the complex and suggest if any misuse of raw materials is going on.

#### Catographic Work

Show the important industrial complexes of Europe, North America, the U.S.S.R., China, Japan, India, Australia, S.W. Asia, Africa and South America in the world outline.

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## CHAPTER IV

### Utilisation of Natural Resources

Human and economic geography embraces a consideration of the activities and occupations of men. For a systematic study, these occupations of men can be classified into three categories i.e., (i) primary, (ii) secondary, and (iii) tertiary. Primary activity includes occupations that are closely related to physical environmental conditions e.g., forest gathering, hunting, fishing, lumbering, grazing, farming and mining; secondary occupation includes manufacturing; and tertiary consists of all the service occupations including transport and trade. The geographical surroundings—both physical and cultural of a place or region influence the primary, the secondary and the tertiary activities of men. In supplying their material needs, people of different parts of the earth generally follow the occupations in which their geographical surroundings and their degree of progress give them the greatest chance of success. For example, the pygmies of the dense equatorial forests of the Congo are hunters and food gatherers because at their stage of culture and to their natural environment such occupations are best suited. The climate in Central Africa is so moist and the forests are so dense that they cannot and do not practise agriculture; cattle in such a climate do not

thrive and it is useless to cut lumber as there is no profitable market for wood. The more advanced occupations like mining, manufacturing, and commerce are beyond the capacity of these people who live in this primitive stage of culture. In contrast to this in more favoured regions such as the Great Plains of India, the level topography, good warm-moist climate, adequate supply of water through canals, wells and tube-wells, cause agriculture to be the main occupation of the densely populated plains of India. Similarly forests are an important resource in the mountainous areas of Northern Sweden, so that the inhabitants are lumbermen. In England the availability of coal, iron ore and other minerals foster mining and manufacturing. In the Netherlands, owing to the location of the country on the shores of the North Sea makes it natural that commerce and transportation should be the leading occupation of the Dutch people. In some regions of the world several occupations are always carried on together. For example, in the Chota Nagpur region of India one can see the tribes depend on gathering and hunting; farmers busy in the cultivation of crops, and the industrialists busy in the development and expansion of industrial complexes.

### GATHERING AND EXTRACTION

Gathering means collection of material from the forest to fulfil the basic needs e.g., food, clothing, shelter, and to earn money by selling them. Man collects fruits, roots, and plants for food, barks, leaves, and grass for clothing, and bamboo twigs and wood for houses. Man also collects medicinal herbs for the treatment of disease and firewood for domestic fuel. This is known as subsistence gathering. In ancient times at the early stage of civilisation man was a gatherer of things from forests and was perhaps wholly dependent on gathering. Gathering and extraction are the major activities of many people and tribes, living in the tropical and the temperate forests. Collection is the simplest type of occupation of man; in some respects it is even more rudimentary than hunting or fishing. Gatherers merely search the forests for valuable plants materials, and the products require only a simple operation for their shipment to the market. Collectors take various parts of the plants, roots, and nuts for food, bark is used for quinine, tannin extract and cork; leaves supply materials for beverage, tree trunks yield rubber, wax, resin, gums, and tannin extracts. The nuts, leaf dust, trunk coatings, and insect hosts provide vegetable wax. In the tropical forests besides other materials the bark and leaves are rich in tanning, mangrove in many places provide one of the cheapest supplies of tannin which is used for tanning sole and other leathers. From the drier forests several xerophytic trees also supply tannin.

In the temperate forests, gathering activities are not so numerous as in the tropical forests. Tanning material is, however, available in large quantities in the temperate forests and it is therefore, one of the leading activities in these forests. In the Mediterranean region sumac furnishes an excellent tannin for fine

leathers. Valonia, the Turkish oak acorns are very rich in tannin. Almost the entire supply of cork comes from the Mediterranean region and it is particularly confined in Portugal, Spain, France, Italy, and Northern Africa. From the pine trees of the temperate forests the naval stores, e.g., pitch, tar, and turpentine are gathered. Although the tropical and the temperate forests provide a number of materials on which many people are directly dependent for their livelihood and others are earning commercial profits, the future of commercial gathering activities is not very safe and bright. Synthetic products often of better quality, and at lower prices, have invaded the markets and taken the place of many articles supplied by the forest gatherers. However, it is not likely that all the demands of such materials will be supplied by synthetic producers, therefore, the continuance of a forest gathering activity in many parts of the world seems assured, but not on a very thriving basis.

### HUNTING AND FISHING

Hunting and fishing are among the oldest occupations of man. For early man hunting was a necessity. He used to obtain his food, clothing, shelter, and tools from the wild animals, birds, and fish. From early times, whenever man has lived by the seas, lakes, and rivers he has caught fish for food and other uses. Hunting and fishing both require direct and simple adjustment to natural environment. Certain primitive and less advanced populations are still fully dependent on hunting and fishing, leading to a migratory or semi-migratory life. There are many primitive societies dependent on hunting and fishing for their basic needs in the equatorial forests (selvas) of Congo, Amazon, Borneo, and New Guinea; in the desert of Kalahari, Western Australia and Arctic,

America, and Tundra. Thus these populations may be found scattered from the equator to the margins of Polar ice-sheets but their numbers are everywhere few and the regions they occupy offer only slight attraction.

These migratory hunting and fishing populations of the present have little influence on the world in which they live. Many of them are decreasing in numbers; some have practically disappeared, either by absorption or as a result of the ravages of introduced diseases and vices or merciless exploitation. Such interest as attaches to them is largely because they afford illustrations of how man must have lived everywhere at earlier periods of time. Thus they not only supply good examples of direct and intimate dependence on the immediate environment, but contemporary illustrations of our ancestral life as well. In the following pages, a few selected population groups of this type and their methods of obtaining a livelihood will be described as illustrative of these facts. For the sake of variety, the groups chosen are from widely separated localities which differ greatly, though all have the common characteristics of possessing a repressive environment. Thus some of the populations are those from the regions of polar cold; others are from the dry desert areas; still others from the humid tropics, where it is too wet.

### The Eskimos

The Eskimos are inhabitants of the polar region of North America, its bordering islands, the coasts of Greenland, and the extreme North-eastern portion of Siberia. Everywhere dependent almost entirely on hunting for a living, they are forced to turn to the sea for most of their food supply and to satisfy their other needs, for the resources of the region where they live are much too meager to support even their limited numbers by hunting on

the land alone. The rigorous cold climate and the extremely low temperatures of the tundra prohibit the cultivation of crops and restrict the growth of vegetation except mosses, lichens and flower plants in the summer season. The soil is thin and that too remains covered under snow. Owing to these conditions the landward hunting ground of Eskimo is limited both in area and resources.

At present the Eskimos pursue two kinds of game. In summer they hunt for subsistence and in winter for the fur trade. The animals that supply food are the reindeer and the American Caribou, which is a smaller variety. The whole life of the Yakuts of Siberia and of the Eskimos in Canada is organised to suit reindeer hunting. In May just when the reindeer, which have been harassed by mosquitoes and gadflies, leaves the forest for the ice-free pastures of the north, and when the beasts return to the forest after having been fattened in summer, that is the time when the real hunt begins. In some years herds of several thousand animals are seen moving in columns thirty to sixty miles long. The Yakuts prefer to attack them as they pass across a stream. When killed, the beasts are pulled up to the bank of the stream. The meat is fried, smoked, or frozen if the temperature is suitable, and stored for the stock of winter.

In Canada also caribou hunting takes place in summer. As soon as spring begins, the Eskimos move away from the coast where they have hunted seals and fish all the winter and go to find the caribous, which are then starting on their summer migration. The traditional method of hunting consisted of driving the animals towards natural or artificially constructed narrow passages where the hunters lay in ambush and attacked the herd with arrows and spears. Sometimes, the herds were driven into deep water, where they were

at the mercy of the hunters. All through the summer the men followed the caribou, moving day after day, to set more ambushes. The game killed in the day was quickly prepared, dried and placed in a 'Cache,' that is, in an underground hiding-place dug down to the frozen rock, carefully marked, and the chase was resumed. Every clan has a certain number of store-houses of this kind to which he has recourse in winter.

In many parts of the area at present occupied by the Eskimos; his former habits of life have changed greatly owing to contact with the white populations. Where this has occurred, with the introduction of firearms and other goods of the white man, the Eskimo has passed directly from the Stone Age to the Iron Age. The introduction of fire-arms, which at first caused greater slaughter, had the effect of making the game dangerously scarce. Besides, frightened by the noise of the guns the caribou deserted some of the hunting grounds to use other routes less accessible to man, so that the Eskimos gave up using guns when hunting for food and when it was necessary to remain as long as possible in touch with a big herd. They keep the guns for hunting in winter, when they shoot single beasts. In winter, hunting takes place in the forest. The Eskimos are mainly busy trapping foxes. Winter hunting is carried on only for the cash return it brings. With the money got from the sale of furs the natives are able to buy tea, flour, and arms as well as little things whose use was formerly unknown, but was learned on their contact with the civilised people. Fishing is done in the spring season when the winter stocks become exhausted. Fishing along the coasts is combined with hunting sea animals. Eskimos also capture seal which is harpooned just as it comes out of its air-hole in the ice to breathe on the surface. The Eskimo knows all the seal's tricks and can

outwit it in a thousand ways.

### *Eskimos—Shelter*

In a land of such limited opportunity, the inhabitants must move from place to place, shifting location whenever game becomes scarce. In summer the Eskimos live in skin tents called 'tupics' made of 50 to 60 sealskins sewed together and stretched over a framework of poles. In winter the Eskimos live in tents called 'igloo' which is lined on the inside with sealskins. In winter when covered by snow, it looks somewhat as though it were built of snow.

### *Clothing and Utensils*

Clothing must be warm in this cold region and, since there are no plants, which can be used, it is made of skins. Even the needles and thread used are supplied by animals, for the needle are of bone and animal sinew is used for thread. All skins are prepared for use by scraping and chewing, for there are no tanning materials in the tundra region. There are no changes of style in Eskimo land and both men and women dress alike, all with a view to comfort and utility rather than appearance. The hunter's weapons are likewise made from animal products. The bow is fashioned by splicing pieces of bone with sinew, traps for catching birds and other small games are also of sinew. With the contact with white men, the bow, and arrow for hunting have been replaced by gun; steel needles and steel strips are also being used. The native dress has been modified, new foods have been introduced; disease, intoxicating liquors, and vices, formerly unknown, have done great harm; and the Eskimo without some admixture of white blood is virtually nonexistent. For to the North in Greenland, less than hundred families live much as did their ancestors and thus serve as an example of an essentially self-sufficient primitive hun-

ting population of the high latitudes.

#### HUNTING POPULATION OF DRY AREAS

In many of the drier and colder parts of the earth's surface, opportunity is too limited to support a large population. Therefore the aboriginal inhabitants still retain their former characteristics, and most of their ways of obtaining a living. The Kalahari Desert of Southern Africa is such an area, still occupied by nomadic people, the Bushmen, whose life will be described to illustrate that of a nomadic hunting population of dry areas.

#### The Kalahari Bushman

The Kalahari Desert which means 'salt pans' stretches over about 140,000 square miles. This desert has approximately 10,000 Kalahari Bushmen, divided into many small clans of a few families each. Population, however, is everywhere sparse, for it requires much land to support a few inhabitants in this dry region. The surface of the desert is undulating, parts of which are occupied by sand dunes. In the Kalahari desert temperatures are moderate to high throughout the year. In the heat of a summer's day, the thermometer may register as high as 114°F in the shade, at night the temperature may fall to 50° F, or even lower during the winter.

Rainfall is scanty and on the Northern margins only about 30 cm. of annual rainfall is recorded. After the rains the 'pans' or shallow depressions breed mosquitoes. Malaria, black fever, dysentery, and enteric fever flourish; pneumonia and influenza are common. The climate is thus not conducive to good health and efficiency.

Throughout the Kalahari, water supply is limited. During the dry months of winter, the soil is often bare or the solid rock is exposed, during the rains of summer, the ground is generally carpeted with vegetation,

for many plants spring up, thus affording a good supply for animals.

After the rains when water supply is abundant in the depressions the grass grows luxuriously and provides plenty of food for the grazing animals. The large grass-eating animals found in this season include various species of antelope, zebra, giraffe, etc., (which furnish food for lions, hyenas, wild dogs, jackals) and many smaller animals like rabbits and hare. Rats and mice are also numerous during this season. Moreover, in this season numerous birds, quail, grouse, partridge, ducks, geese, hawks, eagles, vultures are found in the Kalahari. Reptilian and insect life is also abundant. For a short time after the rains, food is not difficult to obtain for the Bushmen. But the wet season is short and with its close water supply is limited, the animals migrate with the drying up of the pasturage and life for the Bushmen in the Kalahari becomes difficult.

#### Food Supply of Bushmen

The Bushmen has no domestic animals except a few half-wild dogs, used in hunting. He cultivates no fields. His dependence for a food supply is mainly on the results of the chase and some fishing, supplemented by roots, tubers, and other wild plant growths. Bushmen are famous trackers and hunters. Hunting has been developed as an art. Bushmen kill the animals from close distance with the crude weapons. Sometimes game is run down and killed, especially if it has been wounded.

The Bushman is omnivorous. He has been known to eat half a sheep at one sitting. All the larger animals, as well as the smaller including insects contribute to his diet. Ants and their eggs and even lice from his own person are part of his diet. Plant foods, gathered by the women and children, consist

of berries, roots, and fruits. The Bushman is not particular whether his food is fresh or putrid and he appears to suffer no ill effects from such a diet. No provision is made for the future, times of plenty are time of parties and feasting, those of food scarcity are marked by abstinence and near famine. The dry season when the animals migrate to better pasturage and wet areas is the period of hardship for the Bushmen. During the dry season the Bushman becomes very weak and is reduced to bones.

#### *The Shelter of the Bushman*

The Bushman is a migratory hunter, who changes location frequently throughout the year within a fixed clan to follow the game which provides most of the food supply. It is therefore, not practicable to construct a permanent shelter. For his protection from the weather the Bushman uses caves, and shallow holes. Often he may put up a semi-circular hut. In some areas where reeds are abundant in the marshes, he may use reed mats to build crude huts. During the wet weather, he is miserable, for he has no adequate protection from the rain.

#### *Clothing and Utensils of the Bushman*

Clothing is scanty and made largely from the skins of animals. During the heat of the day, the men wear very little. The women wear a piece of skin, hanging from the waist to the knee. Heads are never covered. Bathing is unknown.

Household utensils are limited to the shells of ostrich eggs and a few crude pots. The egg shells of the ostrich are used in halves as cups. Practically all food is eaten raw, or, at the most, half cooked, roasted over an open fire. Therefore few utensils are necessary. Housekeeping arrangements in the land of the Bushman are thus very simple, the principal

problem of the woman is the securing of an adequate supply of water.

The weapons and tools of Bushman include bows and arrows, throwing sticks, knives, fire sticks, and digging sticks. The hardwood bows, strung with sinew are about three feet in length, arrows are made of reeds. The arrows are tipped with bone and iron. Stone and bone knives are used as spears. To increase their effectiveness, arrows are dipped in a gummy poison. Large game is hunted with the bow and arrow or is caught in traps and pitfalls.

The Bushman is a creature of the desert which is his home. He has adjusted himself to the hard and adverse environmental conditions of the Kalahari. The male is generally less than five feet tall, the female about four feet six inches in height. He can live without food for many days. The responsibility of hunting, which supplies most of the food, falls on the men while women gather roots, other plants, and bring water for the family. They are beasts of burden, carrying the few family possessions in addition to babies. Intellectual advancement is slight. Bushman believe in evil spirits and in supernatural events. He has no concrete idea of God. The struggle for a bare existence is too keen to allow any time for speculation which do not have immediate practical results.

#### NOMADIC HUNTING POPULATION OF TROPICAL FORESTS

In the equatorial forests stretching over the Congo Valley, the Amazon Valley and in the interior parts of the islands of South-East Asia, nomadic hunting population is found. The Pygmies in the Congo Basin and the Semang and Sakai in Malaysia are some of the examples of these hunters.

The Pygmies are widely scattered in central Africa extending from Uganda to the

Gabon, mostly between 3° North and 3° South of the Equator, with the groups most numerous in the Congo Basin. Among all of them the Ituri Pygmies, who live in the dense forests of the eastern Belgian Congo are the least affected by their contact with the other populations

The homeland of the Pygmies is one of moderate elevation, for elevation ranges mostly between 1000 and 1500 feet. Soils are thick, but they are of low fertility and only temporarily productive under cultivation. The temperatures are high throughout the year. The heat is very trying and even at night it is not cool. Moreover, relative humidity is constantly high. Rainfall is abundant throughout the year and even in the driest month at least four inches of rainfall is recorded. The climatic conditions favour growth of a dense, tropical forest. These are the environmental conditions of the homeland of African Pygmies.

The Pygmies have no domestic animals, not even dogs and they never till the soil. Their dependence therefore is wholly on hunting, fishing, and wild forest growths. They are expert hunters, capturing and killing even the large-sized animals such as the elephant. In addition to the large animals, they eat white ants, bee, larvae of beetles, and honey. From the forest, they gather wild beans, and other plant foods. They are particularly fond of bananas. Meat is boiled over an open fire until it is dry. The climate does not necessitate much clothing; in fact, often nothing is worn. Most often it is restricted to a strip of bark or skin cloth or a bunch of leaves around the waist. Even ornaments are few in number. Weapons used include the bow and the arrow and a short spear. Some of the Pygmies use poisoned arrows when hunting big animals.

The migratory nature of the Pygmy does not

allow him to construct permanent houses. The shelter of the Pygmies is therefore small crude huts. These huts are constructed of branches. The average temporary village is composed of 10 to 12 of these huts.

The Pygmies are very small in size, some of them only three feet in height. Their average weight is about 75 lbs with some adults as little as 50 lbs. Despite his small size and weight, he is strong, fearless, and daring. He is an adroit climber, highly desirable in his forest environment. The Pygmies are rated as intelligent. They have, however, no regard for time, no record of traditions of the past, no religion, no belief in life after death, but a vague belief in devils. The Pygmy has no laws and no hereditary chiefs. He enjoys dancing. Despite his adaptation to the forest environment in which he lives, the Pygmy is destined to extinction unless protected, for he cannot hope to cope effectively with the new conditions introduced by the arrival of the white population.

Similar primitive populations are known for other tropical forest areas. In New Guinea some tribes are like the Pygmies. The Semang and Sakai are found in the interior mountains of Malaysia and Southern parts of Thailand. These tribes live a nomadic hunting life. The Bhl, Kol, Maurias, Tharus, Khasi, Jaintia, Nagas, and Dodas are some of the hunting and semi-migratory tribes of India.

#### Mining

Mining is one of the oldest activities of man. In man's early progress mining and the use of minerals were so important that they are reflected in such terms as the Stone Age and the Bronze Age. The ancient uses of minerals were largely confined to the making of tools, weapons, utensils, the construction of houses, and roads. Today when the variety of minerals and fuels brought to the surface is

numerous, there are not more people engaged in mining than in forestry, fishing, and farming. Mining affords employment to less than one per cent of the labour force

Mining is a robber-industry, because the deposits of even a gigantic size of a given mineral if continuously mined will exhaust the ores. Men can find new areas of minerals but they can never increase or replace the minerals that are mined. The exploitation of a particular mineral depends on the value of the mineral, mining costs, grade of ore, method used, transport, cost, labour, and market

#### *Methods of Mining*

Most of the mineral output of the world is obtained by either surface or underground mining methods.

**1. Open cast Mining :** This is the easiest and the cheapest way of mining minerals that occur close to the surface. In this method the rock lying over the mineral ore is removed and the mineral is excavated. The overlying rock is blasted to speed up the mining work. It is mostly used in the mining of iron ore, coal, limestone, and gravels.

**2. Underground Mining :** When the ores lie deep below the surface, underground mining methods have to be used. Underground mining methods also embrace several types e.g., (i) shaft tunnel mining of coal, lead, zinc, salt, copper, iron ore, gold, silver, potash, etc.; (ii) adit-tunnel or drift tunnel mining of coal is done by this method, (iii) pumping petroleum and natural gas; and (iv) pressure solutions, pumping, and evaporation of sulphur

**3. Alluvial Mining :** When minerals occur in alluvial deposits they are usually recovered by placer mining. This is done by mixing the alluvial with a great deal of water and tilting or rotating the gravels until the lighter particles (sand, mud, etc.) are washed off,

leaving behind the heavier ores. In some areas ores of gold, tin, and platinum are obtained by this method.

#### ANIMAL GRAZING AND REARING

Animal grazing and rearing is concerned with the domestication of animals for meat, milk, wool, and hides. Animal grazing and rearing may be primitive—carried on by the nomads like Kirghiz and Budwins—or highly scientific as in Denmark and the Netherlands. It may be on a small scale e.g., a small herd of few animals or on a large scale as the sheep farms of Australia having thousands of sheep.

#### NOMADIC PASTORAL POPULATION

Nomadic pastoral population are dependent on flocks and herds for their livelihood. They graze their herds on native grasses and migrate from one place to another in search of grass and water. In the poor grazing areas sheep and goats are more important. Horses and donkeys are common in the semi-arid and the temperate grasslands; while on the high plateaus the yaks are tamed. Camels in the desert and reindeer in the Arctic regions are important. When the pastures are depleted or exhausted, the nomadic herders move their animals and therefore some daily or weekly shift of location is necessary. With the change of seasons these nomads migrate to long distances in the plains and from lowlands to highlands.

Nomadic herding is carried on almost entirely to produce food, clothing, and shelter. The food of nomads is mostly of animal origin i.e., milk, cheese, and meat. The shelter is made of hides, skins, or wool. Despite the importance of the animals as a source from which most of the material wants are supplied, livestock, in the absence of controlled breeding, tends to be of a low grade with some exceptions in the case of horses and camels.

As for the nomads food is never in abundance and always limited in variety; sometimes food scarcity and even famine conditions may occur. At the time of famine these nomads formerly raided their neighbours to secure food. In some cases they penetrated into the plains of India, China, and Europe from the Central Asia.

Though the nomadic-herding areas are well scattered in the different semi-arid parts of the world, they can be classified into the following three regions: (i) Central Asia, (ii) South-West Asia, and (iii) Northern Africa (Fig. 8).

#### NOMADS OF CENTRAL ASIA

The nomadic herding areas of Central Asia include Mongolia, Tibet, Sinkiang, Russian Turkistan, and the Kirghiz Steppe. These are the traditional lands of the nomads.

The Kazaks, Kirghiz and Mongols are among the principal pastoral nomads. These nomads, in search of food, fodder, and water migrate to the foot hills, high valleys, plateaus, broad basins, and high mountains of Central Asia. The climate (rainfall, temperature), soils, vegetation, and grasses also have a great diversity in Central Asia. Owing to the scarcity and uncertainty of rains, cultivation of crops is not profitable. As a result the life of these people is attached to the livestock which flourish well in the grasslands of the region.

#### The Kirghiz

The Kirghiz who live on the high plateaus of Central Asia, have been entirely dependent on nomadic herding for support, moving their herds to considerable distances with the changing seasons. Even at present pastoral

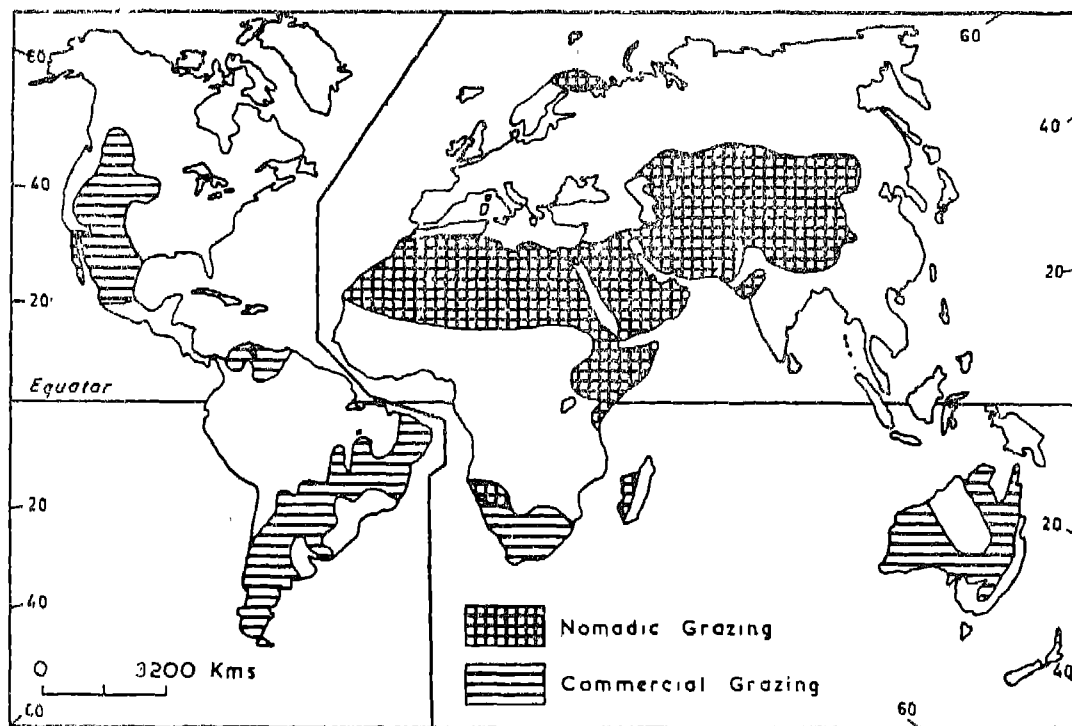


Fig. 8.

nomadism persists in the area where they live. Therefore, this population group will be described to illustrate how such nomads live and earn their livelihood.

The Kirghiz homeland is located in Central Asia far from the sea. To its South is the desert of Sinkiang (China). Its East and West is also bounded by dry regions. Only from the North the approach is relatively easy. This isolation enabled the Kirghiz to remain nomads till recent times.

The topography of the land of the Kirghiz is varied in character. There are numerous hills and plateaus with an elevation of 8000 to 12000 feet. All the plains, plateau, and the lower slopes of the mountains (Tien Shan) afford pasturage for the flocks and herds of the Kirghiz at some seasons of the year.

Water supply is always a critical factor in the life of the Kirghiz. When rivers, streams and lakes dry up in Summer the Kirghiz suffers a great hardship. Since grazing, based on opportunity afforded by natural grasslands constitute the basis for support, the Kirghiz have flocks of sheep, herds of cattle, and beasts of burden such as the horses, yaks, and camels. Inasmuch as pasturage is scanty, the animals must be moved frequently. Such extensive migration necessitates careful organisation, for the fate of thousands of animals being the basis for support cannot be left to chance. Adequate provision must be made for the journey. Routes must be laid out, halting places must be determined, water supply must be assured at each camp site.

The life of the Kirghiz is one of much movement and hardship. Some of the men watch the sheep; others on horse-back care for the herds and hunt stray animals. Milking and all routine work is done by the women. The men assure only those works involving considerable exertion, hardship or danger.

The clothing of the Kirghiz is adapted to the life in the cool damp mountains in summer and in the cold lowlands in winter. At all seasons both men and women wear thick padded gowns that shelter them from the rain, and high boots for walking in wet grass and among the cattle. Much of their clothing is made from the wool of their sheep and the skins of their animals. Men wear big caps of sheep skin and sheep skin coat. Women wear head coverings of cotton cloth from the industrial parts of Russia. The utensils of the Kirghiz are made of leather and wool.

The difficulties of transportation, the isolation, and the lack of other incentives cause the Kirghiz industries and commerce to be poorly developed. Women weave beautiful rugs of wool. Skins of animals are tanned. Commerce is equally backward. In the autumn, herds of sheep, horses, and camels and a few cattle are driven to a distant town for sale. Flour, cloth, guns, and other small articles are bought back. Even in these simple exchange of goods the nomads are frequently cheated by city men.

Among the Kirghiz, education and science are less developed. Individual communities are too small to have schools. The absence of any type of contact with the outside people, and the low stage of culture, prevent the Kirghiz from making scientific discoveries. In religion they are content to follow many Islamic customs, but are too isolated to get many new ideas. Now the Russian government is transforming the mode of life of the Kirghiz. The environment may offer few choices of utilising natural resources. The influence of European civilisation is however beginning to reach them, but their mode of life will probably change only a little as long as they depend mainly upon the grass of the plains and the high plateaus.

### South-West Asia and North Africa

The nomadic herding region of South-West Asia and North Africa consists of Iran, Iraq, Saudi-Arabia, the Plateau of Anatolia (Turkey), Sudan, semi-arid fringes of the Sahara desert, and the high lands of Eastern Africa (Fig 8). In this region, rainfall is scanty and in many parts the average annual rainfall is less than 10 inches. In the semi-arid climatic conditions only grasses of small size grow as the major natural vegetation. The scarcity of rain leads to paucity of pastures. Under these conditions, sheep and goats are best suited as they can survive even under the drought conditions and poorer pastures for sometime. This region is therefore one of the important goat and sheep rearing areas of the world. Angora goats famous for their silky wool, known as 'mohair' are especially numerous in Anatolia. Camel is also more important here than anywhere else as it can live without water and fodder in the hot and sandy deserts and endure hardships. In the highlands of East Central Africa the Mesai is a nomadic herder tribe. The Mesai tribe graze their sheep and goats in short grass areas of the savannas in the valleys in the winter season and in the summer season migrate to the richer pastures of the tall grasslands of the high plateaus and mountain ranges.

### Nomadic Herders of Tundra

On the Southern margins of Tundra there are certain nomadic herders. These herders e.g., the Lapps have adjusted themselves to the food supply of reindeer. In the Northern parts of Norway and Sweden such grazers constitute a significant part of the population. During the short summer they live on the grassy mountains and in autumn they move along with their herds in coniferous areas of the South, in order to meet the fodder requirements of their herds and to protect

them from the severe freezing conditions of the Tundra climate. Many a time they cross the international boundaries to get fodder to avoid starvation. For the Lapps of Norway, Sweden, Finland, and Russia, special provisions of international law have been made to allow them to migrate from one country to another at the time of food and fodder scarcity. The Lapps live in tents, made of light removable and portable wooden frames, covered with a thick sacking of hides. These people wear skin and fur clothes. Meat, milk, and cheese constitute their food.

In the present century a large change has occurred in the life of the nomadic herders. Stretches of temperate grasslands have been brought under cultivation for crops, especially in North and South America, Africa, Australia, China, Iran, and Russia. In the semi-arid areas sedentarisation has been started, and governments are planning to bring more nomadic grazing areas under agriculture. In some areas of pastoral nomadism, industries are being developed and more and more people have started living in permanent built houses of stones and bricks instead of tents. In general the population of the pastoral nomads has been decreasing and areas dominated by them in the past have been shrinking. Moreover, it appears that true nomadism is likely to survive in few pockets of small isolated areas.

### COMMERCIAL GRAZING

The large-scale herds-grazing is carried on in the regions with relatively flat surface and plains where natural grasses grow luxuriously. It is mostly practised in the temperate and tropical grasslands. The leading areas of commercial grazing in the temperate grasslands include the plains and plateaus of North America, South America, Australia, New Zealand, South Africa, Great Britain and

the Ades moorlands (Fig. 8) The average annual rainfall in the temperate grasslands ranges between 25 to 75 cm and has great seasonal and annual fluctuations causing drought and famine conditions in many years

### *Prairie Grasslands*

The temperate grasslands of North America lie mainly in Western United States, the plains of Canada, and North Mexico This is one of the most advanced commercial grazing regions of the world. In the Prairie grasslands, the relatively small amount of rainfall is ample to support short grasses. Not only is the rainfall limited, but the amount received in any one year is subject to great variations and periods of drought sometimes become of several years' duration which hinder the cultivation of crops. Attempts at dry farming, have, therefore, been generally unremunerative except in the more favoured portions of the Prairie grasslands. Because of the limitation climate imposes, these grasslands are in general used for grazing.

The Prairie grasslands have thousands of ranches with more than thousand acres each. The cattles include the white-faced Hereford, Friesian (black and white colour), the Jersey cow, and the superior quality sheep which provide excellent quality of wool in large quantities. Every year millions of cattle and sheep are fattened and transported to large slaughter centres of the Middle-West in U.S.A.

### *South-Eastern South America*

This commercial grazing area includes the temperate grasslands of Argentina, Uruguay, and Southern Brazil. In Argentina, the Pampas undulating lands, between the Parana and the Uruguay rivers, Patagonia and Tierra del Fuego are excellent commercial grazing lands. The Pampas receive about 50 to 100 cm. average annual rainfall, well spread throughout

the year and has cool climatic conditions. As a result a fair growth of grasses like alfafa enable the people to adopt commercial grazing as their main occupation. The ranches are separated from each other by fencing and thus the stocks are not allowed to mix up. The alfafa grass when planted supports one grown-up cattle on every two acres, while in the natural alfafa pastures four to seven acres of land are required to feed one cattle. The occasional summer drought and disease of cattle are the main problems of the temperate commercial grazing regions. Argentina has about 5 per cent of the world's cattle population, but most of them are kept for beef. Despite an enormous consumption of beef in Argentina, there is still a large surplus for export, and Argentina is the world's largest exporter. It's main market is U K.

Three-fourths of the total area of Uruguay is devoted to cattle and sheep grazing. Here oat furnishes the main forage. Owing to the fair distribution of rainfall throughout the year winter's green grasses remain available for cattle and sheep. Uruguay exports large quantities of canned, frozen, dried beef, and wool, hides and sheep skins to Europe.

South Brazil has good pastures and the climatic conditions here permit the year round grazing. South Brazil maintains about one-fourth of the cattle and two-third sheep of Brazil. South Brazil supplies chilled beef to the European countries

### *Australia and New Zealand*

Australia is an important commercial grazing country. It has about 115 million sheep and supplies nearly one half of the world's wool exports

The major grazing areas of Australia lie in the South-East and Western Australia. In the provinces of New South Wales, Victoria, and South Australia, excellent breeds of

here. Besides, local breeds, an appreciable number of Angora goats are also grazed in South Africa. Some beef and cattle products are exported to European countries.

mutton sheep graze on natural pastures. To the West of the mountains in the province of Queensland and in Western Australia, on the Semi-arid grasslands the sheep are mostly of the wool breeds. In the semi-arid areas, shortage of water is a problem for which the government has constructed reservoirs and have dug wells to utilise the underground water resources. Explosion of rabbits and wild-dogs are the major problems of the sheepmen. Long fences have been constructed to stop them from spreading. The problem of rabbits is, however, still to be solved. Despite these handicaps the temperate grasslands of Australia are among the leading commercial grazing areas of the world.

New Zealand is one of the developed countries of the world. Its development and progress almost entirely depends on the sheep and cattle grazing industry. There are about twenty sheep and two cattle per person. In New Zealand rainfall is well distributed throughout the year, the climate is cool and moist which provides plenty of grass and water to sheep and cattle. The mild temperatures permit grazing throughout the year while the mountainous topography is conducive to the mutton and wool varieties of goat and sheep. In New Zealand cattle are kept not on huge open ranches but on fairly small farms and are carefully fed to give quality meat. New Zealand supplies nearly two-third of the world's export of mutton and is an important exporter of wool, beef, and butter.

### South Africa

Near the Southern edge of the South African Plateau lies a region of temperate grassland. It is a broad level area, receiving about 25 to 75 cm. of rainfall per annum. Most of the rain falls during the summer months. Sheep grazing is the major occupation

The temperate grasslands have all suffered from over-grazing. At times, most of these areas experience disastrous droughts. Improvements in the breeds of stocks, prevention of over-grazing and conservation of water resources are, however, necessary if these regions of temperate grasslands continue to develop the world trade in animal products.

### COMMERCIAL GRAZING IN THE TROPICAL GRASSLANDS

The tropical grasslands are known as Savannas. Savanna grasslands are better watered having about 100 cm of average annual rainfall. Tropical grasslands are intermediate in location between the regions of dense tropical forests and the deserts which border their drier margins. These grasslands are commonly laced with forest. All savanna grasslands have a marked seasonal periodicity of rainfall. During the short, rainy summer season, rainfall may be very heavy, but during the much longer dry season it is always light. These are the conditions which permit the growth of grass but do not favour the development of forests.

The grass of savanna is tall, often higher than a man's head and sometimes it even reaches the lower branches of the small trees. The tall grass is hard and tough and makes a poor feed for the cattle. Thus the pastures are poor except for a limited period of time after the rains when new green grass shoots up. Insect pests, disease among both men and animals, labour shortage, distance from market and inadequate transport facilities are the major handicaps in the development of commercial grazing of the tropical grasslands. Nevertheless, commercial grazing of cattle is

an important economic activity in the Llanos region of Northern South America, the Campos region of Southern Brazil, the Sudan of Northern Africa and the savanna grasslands of the Southern parts of Africa (Fig 8).

### Savannas of South Africa

Grazing of cattle is a dominant activity on the grasslands, below 1000 feet in the basin of Orinoco river. This area extends in the West of Guinea Highlands. The average annual rainfall recorded here is about 100 cm. It, however, comes during the summer months.

During the dry season (November to March) the grasses are hard and dry and animals may die from the shortage of water. Moreover, the animals are subject to attack by insect pests and disease so that it is difficult to produce high grade beef.

An area in Brazil, adjacent to the Upper Paraguay River is covered by tropical grassland, called Campos (Fig.8). In this region about 30 inches of rainfall is recorded during the rainy months (December, January and February). During the dry season, grass is dry and pasturage becomes so poor that cattle suffer starvation. The herds are large here but the quality of livestock is poor.

In Sudan, to the North of Equator, the savanna grassland represents a zone of transition between the dense forests of the Congo basin and the desert vegetation of the Sahara (Fig. 8). In this area, cattle are the principal support of most of the native population.

To the South of the Equator in the Union of South Africa, the grazing industry is carried on by the white populations, employing native labour. Here in the high parts (High Veldt) cattle are most important. Moreover, sheep 'merinos' are raised for wool. In the Cape province and in Natal where rainfall ranges from 50 to 80 cm. the native Bantu

populations depend on cattle and sheep. Despite the large number of cattle grazed, however, there is little or no surplus production in these provinces.

The savanna grasslands of Australia correspond closely to the area 50 to 100 cm. average annual rainfall in the Northern Province. The tropical grasslands are significant in the production of drought animals, dried beef, hide, wool, and low grade fresh beef for domestic consumption. The temperatures, tall and hard grasses are however, not suitable for a good breed of cattle, sheep, and goats. Even with the improvement in cattle and sheep breeds it is believed that the tropical grasslands will always remain at best only second rate areas of commercial grazing.

### FORESTRY

The art and science of farming, cultivation, management, and conservation of forests is known as forestry. Forestry and forest industries play an important role in the economy of a nation. It provides opportunities of employment to the people. Forests have been utilised by men throughout the history. They have been used as fuel and before coal was mined, wood was used often in the form of charcoal to smelt minerals. Now wood is used in the construction of buildings, furniture making, paper and pulp making, and synthetic fibre industries. Forests supply a wide range of minor products, such as pitch, turpentine, tannin, nuts, herbs, and gums.

Forests have been largely exploited, used, and misused by man. Consequently forest resources have been reduced and with the increase in population the world demand of timber and timber products has increased. The necessity of maintaining supplies of timber for future generations has, however,

been realised, especially in the developed countries of Europe, America, Australia, New Zealand, and Japan. Care is to be taken to prevent erosion, afforestation, and to fight pests and disease which attack the trees.

### **Lumbering**

Cutting of wood from forests is known as lumbering. Lumbering is the most important activity connected with forests. Though lumbering is carried on in many regions of the world, its major areas are in Northern Europe, Taiga forests of Siberia, and North-East America. The growth, development, and expansion of the lumbering industry depends on the type of forest, relief of land, transport facilities, climatic conditions, local demand and supply of labour. It is mostly carried on in the temperate and tropical forests of the world. The major characteristics of lumbering in the two zones can be summarised below :

#### *Temperate Lumbering*

The temperate forests are the major suppliers of wood for construction, pulp, paper, and furniture industries. In these forests single species occur over large stretches of land which make it easier to locate and extract the good quality timber. The lack of dense undergrowth in these forests is also an advantage. The trees are generally smaller and lighter which could be transported over long distances at a low cost of transportation. Forestry in the temperate forests have been modernised and a wide range of machinery is now used for obtaining the timber. Power-saws, tractors, and other heavy machines are used for the cutting and transportation of logs. These forests are near the major industrial areas of the world, where timber, paper, and pulp products are in constant demand. In the developed countries of Europe

and North America the management of forests is of a high standard and forests are run on a rotation system, whereby certain areas may be cut at an interval of 50 to 70 years.

#### *Tropical Lumbering*

In the tropical areas, the climate is hot and moist which leads to a luxuriant growth of thick evergreen forests. The lack of accessibility, owing to dense forests is the main hindrance in the exploitation of these forests. Moreover, the hard wood and poor demand are also not conducive for tropical lumbering. Nevertheless, wood e.g., mahogany, spanish cedar, ebony, rosewood, ivorywood, cedar, sandalwood, and many other teak woods are cut for the local and international markets. These forests with their varied and valuable timber are becoming more and more important each year. The large areas of tropical forests represent a future source of wood.

#### **Preservation of Wild life**

Preservation of wildlife means the regulation of wild animals and plants in such a way as to provide their continuance as natural resource. The preservation and conservation of wildlife is to provide food, to rebuild opportunities for hunting and fishing and to provide aesthetic enjoyment to our people. In order to achieve these objectives, the total population of fur-bearing animals, game animals, birds, and fish is to be increased.

Some of the animals and birds which were in a wild state e.g., cattle, horses, sheep, goats, hogs, ducks, chickens, and dogs have been domesticated by man. Wild animals, however, still constitute an important source of human diet. In many of the European countries, Japan, China, and America fisheries are an important source of food to many million of people. Fisheries provide employment and

whale hunting in the oceans is an important source of oil. Fisheries conservation is therefore essential and the following steps can be taken to conserve them : (i) prevent over-fishing in streams, lakes and coastal waters; (ii) build more ponds and reservoirs for fisheries; (iii) arrangements and international agreements between countries as to the number and kinds of fish to be caught; (iv) prevent pollution of streams ponds, lakes, and seas by industries; and (v) re-stock streams and lakes.

Fur is a great source of clothing in cold countries. In the past, when forests covered vast stretches of land all over the world, fur-bearing animals were plentiful and were easy to catch. The depletion of forests in the thickly populated parts of Europe and South-East Asia led to a scarcity of space for these animals. Conservation of fur animals is, however, a necessity of the day.

In the tropical forests there are numerous wild animals but their number is fast declining as they are eagerly sought by big game hunters and diseases. The natural home of wild fowls

(ducks, swan, geese) was lakes and swamps. Many swampy areas have been drained and so the supply of many wild fowls has become limited. The passage of laws is a right step towards the conservation of wildlife. The delimitation of areas as game refuges has done much to help wildlife of all kinds of birds and animals.

The management of living resources, needs a high degree of international cooperation. This is particularly important for conservation of fish and other aquatic animals that occupy international waters. It is equally important for migratory birds and animals that move from one country to another. Despite the general recognition of these problems, unfortunately only a few countries are doing much for the conservation of wildlife. In order to enhance the material welfare of the present and future generations, the conservation of wildlife is of paramount importance as the advantages accruing from wildlife are numerous.

## EXERCISES

### Review Questions

1. Differentiate between the primary, secondary and tertiary occupations of man. Illustrate your answer with suitable examples.
2. Explain the following occupations :  
(i) gathering, (ii) hunting, (iii) fishing, (iv) mining, (v) lumbering.
3. Classify the following into the primary, secondary, and tertiary occupations :  
(i) grazing, (ii) driving, (iii) mining (iv) engineering, (v) farming, (vi) herding, (vii) inland-fishing, (viii) sheep-rearing, (ix) radio-making, (x) film-making, (xi) pulp-making, (xii) textiles.
4. Describe the way of life of any one of the following .  
(i) The nomadic pastoral population of Central Asia.  
(ii) The nomadic pastoral population of North Africa.

- (iii) The nomadic herders of South-west Asia.
- (iv) The nomadic herders of the Tundra.
- 5 How does man's stage of development affect his choice of means of obtaining a livelihood ? Illustrate with examples.
- 6. Describe the physical environment of the Eskimos and illustrate how the Eskimos have adjusted themselves to their natural surroundings.
- 7 Describe the lives of Bushmen or Pygmies and explain the causes of their under developed culture.
- 8. Why are the too cold, too dry and thickly forested tropical regions still the homes of the nomadic hunting populations ?
- 9 Why are all the nomadic hunting populations of the world few ? Why are their numbers generally decreasing ?
- 10. Describe the necessary steps for the conservation of wildlife

### Find Out

- 1. Prepare a list of primary, secondary, and tertiary occupations in your locality
- 2. Visit the forest areas in your neighbourhood and record the way of life of the lumbermen.
- 3. If you have a migratory tribe in your area, narrate in brief its way of life

### Cartographic Work

On the outline map of the world show the following

- (a) the nomadic areas of the tropics; (b) the nomadic areas in the temperate lands,
- (c) the nomadic areas of the hot deserts; (d) the nomadic lands of Tundra.

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## CHAPTER V

# Agriculture

Agriculture includes the practices, art, science and industries utilised by man to obtain food from the soil. It includes the cultivation of crops and the rearing of live-stock. Agricultural land is the most basic of the world's vast and varied resources as it provides food, clothing and shelter to the human masses.

The beginnings of agriculture are a matter of speculation. Some experts are, however, of the opinion that agriculture began in South-West Asia sometime around 4000 B.C. But modern dating techniques trace its origin to about 7000 B.C. The oldest evidence available from the Stone Age Man reveals that man used stone and wood weapons for soil-tilling and working, and, therefore, the history of agriculture is at least as old as the Stone Age.

Probably in the long past, with the increase in population and demand for food, the people at that time began to establish settlements to live in, in the form of settled communities. As the settled people's civilization became more and more advanced, the demand upon the resources of the environment became more exacting. In an ever-expanding community ways and means had to be found to increase the agricultural productivity of land. With the spread of agriculture in various parts of the world, progress was recorded in

every aspect of crops production. In modern times, the use of steam, oil, and hydro-electric power allows farms to be mechanised which not only raises productivity per acre but also brings a rapid expansion in the total land area under cultivation. Mechanisation creates large-scale surpluses so that international trade in agricultural crops now becomes possible. Thus, while countries like the U.S.A., Canada and Australia produce surplus crops and export them to other countries, many industrial countries of the world such as Great Britain, the Netherlands, and Denmark support their large populations on food imports.

### AGRICULTURAL SYSTEMS

In general the distribution of types of crops and farm activities is influenced, directly or indirectly, by slope, structure, climate (moisture, sunshine, winds, frost, fog), soil, and socio-economic factors like land tenure, labour, marketing, irrigation, transport, and mechanisation, etc. As a result of these factors various agricultural types (agricultural systems) have emerged in different parts of the world (Fig.9). These agricultural systems could be classified as shifting, sedentary, subsistence, commercial, intensive, extensive, mixed farming, dairy farming, truck farming and

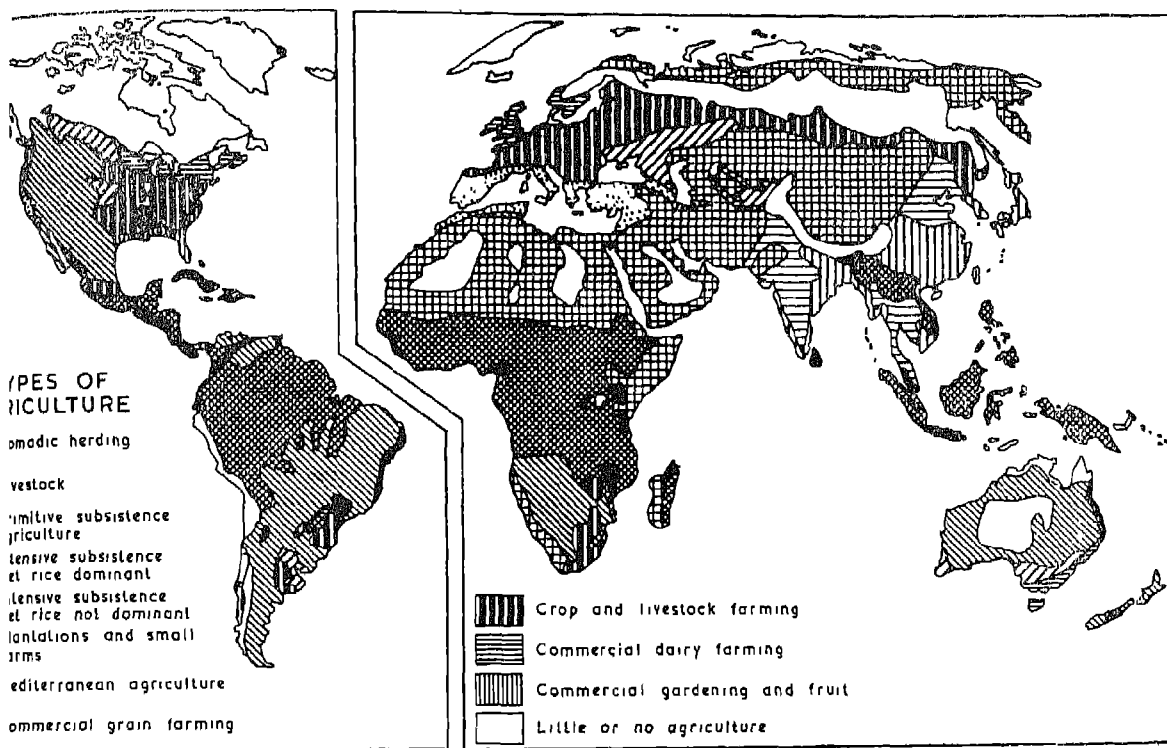


Fig. 9

horticulture. These may be carried on, on individual, collective, or cooperative basis.

### Shifting Cultivation

Shifting cultivation is a primitive form of utilisation of the soils, usually of tropical rain forests and bush areas of Central Africa, and South-East Asia. In shifting cultivation, farmers grow food only for themselves and their families. Some small surplus may be either exchanged or bartered (i.e., payment in kind) or sold for cash. The resultant economy is thus static with little chance of improvement but there is a high degree of rural independence.

Shifting cultivation is called by different names in different parts, of the tropical world.

It is known as 'slash and burn' and 'bush fallow' agriculture. Local terms include *Ladang* (in Indonesia), *Jhuming* (in the hills of North-East India), *Caingin* (Phillipines), *Milpa* (in Central America and Mexico), *Ray*, (Vietnam), *Conuco* (Venezuela), *Roca* (Brazil) and *Masole* in the Congo and Central Africa. The essentials of shifting cultivation are the clearing of a patch of primary or secondary forests with axe or cultass, burning the wood and shrub, planting of crops for a few years in the clearing, gathering the crop in harvest time and movement to a new site when the fertility of the soil is seriously reduced. It is practised in a four- to eight-year cycle.

In the North-Eastern region of India, comprising the states of Assam, Meghalaya,

Manipur, Tripura, Nagaland and Mizoram, the tribal communities in remote areas practice shifting cultivation. They select a patch of forest, cut down vegetation, leaving the larger and economically useful trees, clear the undergrowth and burn the field wood and shrub. The crop is sown by the broadcast method in the clearing and it receives only cursory attention during its growth. After the first harvest, crops are sown for a further year or two and the land is left unoccupied. Thus the essential feature of shifting cultivation is the rotation of fields rather than crops. The average size of a field is an area of about 0.50 to 0.70 hectare. Moreover, inter-tillage or mixed cropping is common i.e., a number of different crops are sown in the same patch of land. Mixed cropping (root crops and cereals sown together) in shifting cultivation helps in recouping soil fertility and protects the soil from erosion. Fallowing of land is generally practised in *jhuming* which is helpful in restoring plant nutrients to the soil and plays the role that manures, fertilizers, legumes, and rotation of crops play in other farming systems. It is carried on with minimum implements—axe and sickle. Shifting cultivation is thus a remarkable adjustment to the environmental conditions of the tropical and sub-tropical forest-covered areas of the world.

Nevertheless, shifting cultivation is one of the major drawbacks of agriculture in the states of North-Eastern India. Change over from shifting cultivation to sedentary farming which is essential for agricultural development has proved to be a great socio-economic problem. Once the local population practising *jhuming* can be convinced of its harmful effect, *jhum* land can be put to much better use. The following steps can go a long way in converting shifting cultivation into permanent cultivation. In shifting cultivation a farming family does

not own any land as the land belongs to the community. So he has no impetus to invest money in permanent improvement of his land or for improved cultivation. A solution to this problem is, therefore, essential. The tribals who practise shifting cultivation are not able to purchase good quality seeds, fertilizers, insecticides because they are not economically well off. So a suitable system has to be evolved through which a farmer can obtain money on loan. The cash crops (ginger, turmeric, tapioca and fruits, etc.) grown by the shifting cultivators are often damaged owing to non-availability of market and storage facilities. The establishment of small-scale agro-industries to utilise these agricultural raw materials should also be carefully examined.

#### *Sedentary Agriculture*

Agriculture as practised in one place by a settled farmer is called sedentary agriculture. Virtually all agriculture is now sedentary in nature but the term was used for primitive agriculturists in Africa who farmed the same land indefinitely in contrast to shifting cultivation.

Sedentary agriculture is mostly confined to the tropical lands where the fallowed fields are frequently re-used and the cultivator stays permanently at one spot. Rotation of crops is also practised in some places, and greater attention is given to the land and to the crop sown. Methods of tillage are more intensive though crude, hand implements are often still used and there is great employment of man-power in the fields. This type of farming is capable of sustaining a relatively larger population on a permanent basis. Many more animals are kept including buffaloes. The animals tamed are used for draught purposes on the farms as well as to supply milk and meat. Crops are sown in the cool season and grow throughout the rainy period to be

harvested in the dry season. Many sedentary farmers in Central America and South-East Asia also find jobs in plantations and return to their homes periodically with their earnings. In South-East Asia and West Africa, subsistence farming may be combined with the cultivation of cash crops or with the collection and sale of forest products.

### *Subsistence Agriculture*

Subsistence agriculture is the type of farming in which crops grown are consumed by the grower and his family. Subsistence agriculture may be of different types. It may be shifting or even settled agriculture. It may be primitive or non-primitive in character. It may be both intensive and extensive in nature. As long as its major purpose of fulfilling most of the needs of its local producers, remains unchanged, it remains subsistence farming.

The main distinction between primitive and non-primitive (sedentary type of subsistence agriculture) depends upon the tools and equipment used. The tools of the primitive agriculturist are more or less the same as those used in shifting cultivation, while in non-primitive subsistence agriculture wooden ploughs, harrows, hedges and permanent bundings are used. In India subsistence agriculture is practised in the less developed parts of Madhya Pradesh, Bundelkhand, Eastern Uttar Pradesh and South Bihar.

### *Intensive Subsistence Agriculture*

Intensive subsistence is best developed and practically confined to the monsoon lands of Asia. Intensive subsistence agriculture is carried on in China, Japan, Korea, India, Bangladesh, Burma, Thailand, Sri Lanka, Malaysia, the Philippines, Indonesia and Vietnam. Population densities in these agrarian countries are higher than those of the

industrial areas of Europe and America. The fast-growing population, almost unchecked for centuries, necessitates an even greater intensity in the tillage of land. Farming in both the wet lowlands and the terraced uplands is, therefore, very intensive to support the dense population.

Basically there are two types of intensive subsistence—that dominated by wet-paddy and that dominated by other crops such as wheat, pulses, maize, millets, sorgham, Kaoling, soyabean, cane-sugar, tubers and vegetables.

### *Intensive Subsistence dominated by wet-paddy*

Intensive subsistence dominated by wet paddy is mostly practised in Monsoon Asia. This form of agriculture has the following characteristics: The size of the holding is very small. Farms have been sub-divided through many generations so that they have become extremely small and often uneconomic to run. An average farm in Japan is 0.6 hectare, in Kerala and West Bengal (India), it is even smaller. Individual peasants grow crops mainly to support their own families, though there may be some surplus for sale in some areas. In Monsoon Asia the peasants are so 'land hungry' that every bit of tillable land is utilised for agriculture. The fields are separated only by narrow hand-made ridges and footpaths by which the farmers move around their fields. The boundary-bunds locally called *maindh* are kept very narrow to save space. Only the steepest hills and the most infertile and alkaline (*reh* and *kallar*) patches of land are left uncultivated. Farming is so intensive that two, three, and even four crops are harvested in a year. In parts where only one crop of rice can be raised the fields are normally used in the dry season to raise other food or cash crops such as oats, pulses, tobacco and oilseeds.

In wet-paddy agriculture, traditionally much hand labour is required. Ploughing is done with the help of buffaloes, oxen, and horses. The paddy crop is planted in narrow rows by the women, while harvesting is done with sickles and threshing is done by manual labour. Farm implements are often very simple. Recently machinery has been developed which can work on the flooded plains for ploughing and hoeing. Machines are used in the farms of Japan and China and are gradually spreading throughout Monsoon Asia.

In this type of agriculture the cultivators concentrate on the cultivation of food crops, especially rice and vegetables and, therefore, there is little pasture available for animals. Comparatively few sheep, goats, or horses are kept in wet-paddy areas. Buffaloes are kept as draught animals in many parts. Poultry on a small scale is common and pigs are kept as scavenger animals on the Chinese and Japanese farms. Many farmers practise fish-culture on their fields (e.g., in Bangladesh and West Bengal) to satisfy their need for protein food.

In order to ensure high yields and to maintain high fertility of land the farmers make use of every available type of manure including farm waste, rotten vegetables, fish waste, cow-dung and human excreta. Moreover, green manures and fertilizers are also used to increase the fertility of land. The farmers of West Bengal and Kerala provide a good example of intensive subsistence wet-paddy agriculture.

#### *Intensive Subsistence Agriculture dominated by other crops*

Owing to variations in relief, climate and soils it is not practicable to grow paddy in many parts of the Monsoon World. Though methods of cultivation are equally intensive

and farming is on subsistence basis, a very wide range of other crops is raised. In North China, Manchuria, North Korea, the Punjab, Haryana and Western Uttar Pradesh wheat, barley, maize, millets, soyabean and oilseeds are extensively grown. In Burma, Thailand and peninsular India, millets and maize are the dominant crops as rainfall in these areas is not adequate for the cultivation of rice. Farming in these areas has very similar features to those of wet-paddy cultivation i.e., an intensive use of land, much manual labour, little use of farm machinery and the use of a variety of manures and fertilizers. Irrigation of crops is often made to make good the lack of moisture though this has not been fully developed in many areas.

In India holdings are small and uneconomic. One-fourth of the total rural population own land less than 0.4 hectare and another one-fourth are landless. As a result, the farmers are poor and the majority of them cannot afford to purchase modern agricultural implements, fertilizers, quality seeds, and insecticides. Though tractors are popular with the prosperous farmers of the Punjab, Haryana and Western Uttar Pradesh, oxen, and buffaloes are the chief draught animals.

#### **Plantation Agriculture**

Plantation agriculture is carried on in the tropical areas to grow cash crops mainly. Thus it is the specialised commercial cultivation of cash crops on estates or plantations. It is found in many parts of Asia, Africa and tropical and sub-tropical America. Some of the main plantation crops are rubber, oil-palm, cotton, and copra; beverages like coffee, tea, and cocoa; fruits like pineapple and bananas, and also crops like cane-sugar, hemp and jute.

The system of plantation crops originated during the colonial period, using European

organisation, skill and capital, and cheap labour; in some cases, in the early days, with slaves or forced labour, e. g., Negroes from Africa as slaves in the cotton production of the United States and the Tamils from India as paid labourers in the tea plantations of Sri Lanka and rubber plantation in Malaya.

Farming in plantation is executed with specialised skill and wherever possible with the application of machinery and fertilizers. It aims at high yields, high quality production and a large output, most of which is exported. The final products, whether sheet-rubber, palm-oil or tea have to be carefully processed and standardized to meet the world demand and specifications. Competition in such production is very keen. Estates are, therefore, better able to meet these demands than individual, small holders.

In the tropics and sub-tropics where plantation agriculture is practised, the use of white labour was known impossible for climatic and health reasons. But all parts of the tropics are, however, not equally well suited to the development of plantation agriculture. Some areas have very heavy and continuous rainfall, others have very little precipitation. Again temperature conditions are not always adapted to growing the products desired nor are they favourable for man. Further, climatic hazards, strong winds, topography, drainage, soil and vegetation conditions often handicap or may even prevent development of plantation. Accessibility, availability of labour, difficulties of clearing vegetation, prevalence of disease and insect pests, rapid deterioration of tropical soil and government policies are some of the main determinants in plantation agriculture. Owing to these factors, plantations are confined in narrow areas of the tropics along the sea coasts and those served by roads, railways and navigable rivers.

Plantation farms are generally large and are found mainly in the thinly populated areas. The size of a farm varies from 40 hectares in Malaya to 60,000 hectares in Liberia. In these estates a large disciplined but not skilled labour force is necessary. Because plantations have usually been established in the sparsely populated areas, labour has to be imported and provided with housing, food, educational, and medical facilities. In the past, slavery was a solution to the problem, and later indentured labourers particularly Indians, went to sugar plantations in various parts of the British Empire. Indians also provided much of the labour for Malaysian rubber and Sri Lanka tea plantations.

The technical and managerial staff have invariably been European on plantations. Nearly all the plantation crops have to be processed before leaving the plantation. There are a number of reasons for this processing. First, the yield of many crops decline quickly after harvesting, second, processing gives a product a higher value per unit weight that can be transported over long distances, third many products are perishable in their unprocessed forms but not after processing. The need for processing plantation crops varies from crop to crop but as a matter of fact the more complex the process, the more likely the crop is to be produced on plantations rather than small holdings. Annual crops are less suited for plantations than perennial trees or bush crops, since the latter need far less cultivation and after planting yield for many years and do not have marked seasonal labour peaks. The plantation system on the whole, however, largely depends on the exploitation of cheap labour.

#### *Intensive Agriculture*

The application of capital and labour, to a relatively small piece of land, in order to

obtain high yields of crops and to produce several crops in a year is known as intensive cultivation. In intensive cultivation heavy doses of fertilizers, better quality seeds, insecticides, irrigation, crop rotation and green manuring practices are adopted. It is carried on in those parts of the world where

manual labour is entailed (iii) animal farming is little developed (iv) double or triple cropping in a year (v) heavy use of manures, fertilizers, pesticides and irrigation (if required).

#### Extensive Agriculture

Highly mechanised farming on large

TABLE II  
Plantation Crops 1974

Crop	Area in Million hectares	Value of export in million	America		Asia		Africa		Oceania	
			a	b	a	b	a	b	a	b
Cotton	31	2300	35	42	37	14	9	25	..	...
Groundnut	18	402	15	..	53	9	30	82	..	...
Sugarcane	10	2090	50	50	39	17	7	8	4	7
Rubber	6	1250	1	...	90	89	7	5	...	...
Coffee	6	2280	66	69	06	05	27	25	..	..
Cocoa	5	536	25	19	..	..	72	79	...	..
Tobacco	4	1070	31	62	46	16	5	10	...	...
Jute	2.9	170	...	..	96	94	...	..	...	...
Bananas	1.6	433	61	76	25	11	5	9	...	1
Tea	1.2	666	...	..	87	81	7	10	..	..
Coconut	.	406	8	3	77	83	5	1	6	1
Palm-oil	.	246	..	..	25	..	69	...	...	...
Sisal and Agaves	1.2	120	48	...	3	54	49	39	...	...

a : % of weight of output b : % of value of exports

Source : FAO Production Year Book 1974.

the per capita share in cultivated land is low, the land available for cultivation is limited and the density of population is very high. Countries like China, Japan, Bangladesh, India, the Philippines, Vietnam, Malaysia and Thailand practise intensive cultivation.

Intensive agriculture can be classified into (i) intensive agriculture dominated by paddy and (ii) intensive agriculture dominated by other food crops. A description of these agricultural systems have been given under the headings of intensive subsistence farming. The main characteristics of intensive cultivation however, are (i) very small holdings (ii) much

holdings, employing little labour, with relatively low yields per acre but a large total yield and a high yield per man is known as 'extensive agriculture.' This type of agriculture is practised in sparsely populated areas where new lands could be brought under cultivation.

Extensive cultivation is a relatively new development. It is carried on in the continental lands of the mid-latitudes which were roamed previously by nomadic herdsmen. The continental areas, well away from maritime influence and the low precipitation (between 300 and 600 mm), make crop cultivation a calculated risk. It was farm machinery which enabled farmers to cultivate grains like wheat on a large scale. Communication with the outside world is mainly by railway

and the bulk of grain harvest is exported. Extensive farming is best developed in the Eastern steppes (U. S. S. R.), the Central and Western plains of the United States, the Canadian-Prairies, the Pampas, of Argentina and the Australian towns. The main characteristics of extensive agriculture are as follows.

In extensive farming the size of the farm is generally large, ranging from 240 to 16000 hectares; settlements are small and often widely scattered, leading to isolation as a major problem. Cultivation is highly mechanised and thus all agricultural operations starting from ploughing to harvesting are entirely done with the help of machines. Tractors, ploughs, drills, combine harvestors, threshers and winnowers are the major agricultural machines used in extensive farming. Large barns are erected by the farmers for the storage of cereals. Monoculture of wheat is the main characteristic of extensive agriculture and its crops are known as the winter wheat and spring wheat, depending on the time and season of the sowing of the crop. Among the other cereals, barley, oats, rye, flax and oil-seeds are grown. Wheat grown on extensive mechanised farms gives a comparatively low yield and the average yield is seldom more than 1500 kg per hectare, whereas, under intensive cultivation in Japan and in the Punjab the yield is generally more by three times. In extensive cultivation the labour force is small but due to the mechanisation, per man production is high. Other features of extensive agriculture are, lack of irrigation, ownership of farm lying with the farmer and the absence of the tenant system. At the peak of the harvesting period a few extra hands may be hired. The crops are prone to climatic hazards. Fluctuations in the market lead to loss to the grower and therefore they have started more mixed farming in place of monoculture of wheat.

The major belts of wheat production have,

however, constantly been placed away from the major market areas, a consequence of rising land values as population has grown and expanded outwards from Eastern U.S.A., Buenos Aires, coastal Australia and the Ukraine. The movement has been into more arid regions. Extensive farming has been displaced by more intensive mixed farming systems, and has in turn invaded areas occupied by even more extensive systems e.g., ranching, nomadic herding. The stereotype of the large mechanised wheat monocultural farm system was thus started in the nineteenth century and had a short history. This system now survives in just a few places.

#### MIXED FARMING OR COMMERCIAL CROPS AND LIVESTOCK

Agriculture involving both crops and livestock is called 'mixed farming'. This is not to be confused with 'mixed cultivation' merely employing a series of different crops sown on the same piece of land. Mixed farming is found throughout Europe—from Ireland in the West through Central Europe into Russia. It is also found in North America, East of the ninety-eight meridian, in the Argentina Pampas, South-East Australia, South Africa and New Zealand (Fig. 9). Mixed farming, as a matter of fact, is essentially associated with the densely populated, urbanised and industrialised societies, dependent upon high incomes for the sale of its products and upon manufacturing industry for the provisions of its inputs. Mixed farming yields fairly high agricultural returns because of efficient methods of farming, excellent transport system, nearness to urban markets and reliability of precipitation. The cool-moist summers and comparatively mild moist winters promote the growth of hay crops and grasses in many mountainous areas and low flat lands. Pastures remain fresh all the year round and large

flocks of sheep and herds of cattle are grazed.

The main characteristics of the mixed farming system are that farms produce both crops and livestock and the two enterprises are integrated. At least 20 per cent of the cultivated land is under grass; while in the maritime regions grass occupies upto 75 per cent of the agricultural area. Grass is treated with as much care as an arable crop. This alone distinguishes mixed farming from other farming systems. In mixed farming a number of crops are grown. Cereals dominate the crop land use, the leading grain varying with climate and soil. In Europe wheat and in the U.S.A. corn dominate the land use patterns. A large proportion of cereals is fed to animals on the farm or sold to manufacturers of feeding stuff. In Europe a second major category of crops grown is roots. Turnips, sweet potatoes and sugar-beet are the major root crops in mixed farming. Potatoes are grown as vegetables for feeding pigs and cattle and in West Germany for sale to distilleries. Sugarbeet is generally sold to sugar refineries. Mixed farms are characterized by high expenditure on machinery and farm buildings, extensive use of manures and fertilizers and also by the skill and expertise of farmers who need to know about all aspects of farming to grow and market their range of products successfully. Mixed farming has a three-fold advantage. In the first place it protects the farmer against the risk of poor prices and disease. In the second place, it spreads labour requirements more evenly throughout the year. Thirdly, it helps in the maintenance of soil fertility if crops are grown in rotation. Instead of growing the same crop in the same field, a succession of different crops is grown which reduces the risks of plant disease.

In mixed farming livestock is fed in a variety of ways. The crop output is fed to the cattle and pigs. In winter the forage

crops and important concentrates are fed to livestock. Livestock feed on crops grown on the farm and graze the pasture. In return their manure helps to maintain soil fertility. The combination of crops and livestock further evens out labour demands during the year. Livestock require daily attention and family labour is thus fully utilised. The rising labour costs have, however, made it increasingly difficult to keep a variety of livestock and grow a wide range of crops.

In mixed farming the average size of the holding varies from 10 to 50 hectares in England and 40 to 100 hectares in the United States and Canada. These farms are mostly owned and operated by family labour and hired farm labourers are uncommon. Moreover, tenant farming is unusual.

#### *Dairy Farming*

In dairy farming cattle are kept for milk, butter, cheese and condensed, evaporated or dried milk. Pigs and poultry are often associated as the side occupations of dairy farming.

In various parts of Western Europe, e.g., Britain, Ireland, Belgium, Denmark, the Netherlands, Southern Scandinavia, Switzerland. To the South of the Great Lakes of America, farmers specialise in commercial dairy farming, which is a highly intensive type of livestock farming. It is also practised in South-Eastern Australia and New Zealand. Milch cattle are kept to supply fresh milk to urban districts or industrial centres.

Dairy farming is most important where the climate is too damp for cereal cultivation, but is also geared to urban markets. It is usually a capital-intensive type of farming. Though natural pastures are usually most important, many farmers keep their cattle under cover in winter. The animal sheds and storage facilities for winter fodder have to be provided. Much mechanical equipment is also used, e.g.,

milking machines, feeding towers. Modern methods of cattle breeding and herd management allow high yields to be attained,—as much as 3000 kg (6500 lb) of milk per cow per year—and thus profits are maintained.

### *Truck Farming and Horticulture*

Specialised cultivation of vegetables and fruits grown farther away from markets and involving transport is known as truck farming. The truck farming system is well developed in the densely populated industrial districts of North-West Europe—Britain, Denmark, Belgium, the Netherlands, Germany and France, and in the North-Eastern parts of U.S.A. In these countries there is heavy daily demand for fresh vegetables, table fruits, salad, eggs, milk and meat. The Netherlands specialise in the cultivation of spring flowers such as tulips which are flown to all the major cities of Europe and America. In the United States, California is the leading vegetable growing state but market gardening or truck farming is important also in the Lake Peninsula, Florida and the coastal states of Canada. The distances of the truck farms from the markets are governed by the distance a truck can cover overnight. Hence the name truck farming has been given, though some fruits e.g., citrus fruits depend on the climatic rather than the market factor.

Market gardening has the following characteristic features. The farms are small and are located where there are good communication links with consumers. The land in truck farming is very intensively farmed and irrigation is often used. Vegetables may be grown in fields or in glass houses. Soil fertility is maintained by the heavy application of manure and fertilizers. Most of the work is done by hand labour, and in order to attain maximum yields and high cash returns, market gardens are scientifically man-

aged, using selected seeds, insecticides, nurseries, artificial heating methods and speedy disposal. Owing to these factors the per capita outlay is heavy.

In India the warm and sunny climate allows the cultivation of a wide range of green vegetables, fruits and flowers. Beans, onions, tomatoes, carrots, pumpkins, cabbage, cauliflower and all the leafy vegetables of the warm temperate latitudes are grown. The seeds of different vegetables are sown in the different parts of the year which help in maintaining a constant supply of vegetables to the urban markets. Although vegetables in India are grown in or around almost every village, town and city, their cultivation is more important in the vicinity of big urban centres (e.g., Bombay, Calcutta, Delhi, Madras, Hyderabad, Kanpur, etc.) mainly because of the heavy demand. In Srinagar vegetable cultivation is carried on in the Dal Lake mainly during the spring and summer seasons to meet the fresh vegetable requirements of Srinagar and its neighbourhood. Moreover, a large variety of fruits, e.g., mangoes, apples, oranges, grapes, bananas, guavas, peaches, apricots, plums and cheeku are grown under the different climatic conditions of India. Besides local consumption mangoes and other fruits are exported to the distant markets of the Middle East, Europe, Russia and America which fetch a handsome amount of foreign exchange.

### **Individual, Cooperative and Collective Farming**

Agricultural systems have been considered in terms of the methods used and the types of crops grown or livestock reared. It is also important to realise the effect of the farming organisation on agriculture. The farming organisation is affected most by the way in which the land is held; that is whether the farmer owns his farm, is a tenant, or merely, a labourer,

In many areas recent changes have taken place in land tenure. For example in the Communist countries farms have been *collectivised*.

### *Individual Farming*

In individual farming, the individual farmer is in full possession of his land. Ploughing, sowing and harvesting operations are done by the farmer himself. At the time of peak labour demand (sowing and harvesting periods) the farmer, however, may hire labour and pay him in cash or kind. These farmers who own their land, buy their own seeds, machinery, equipment, fertilizers and insecticides. The farmer then sells his crops and obtains the reward. Profit or loss is borne by the farmer. As the resources of the individual farmer are generally limited, he may be deprived of many of the facilities of large-scale cooperative or collective farms, especially in the matter of harvesting and marketing. In most of the countries of North-West Europe, India, Pakistan, Sri Lanka, Burma, Indonesia and Malaysia the individual farming system is prevalent.

In India, after Independence, the intermediary tenures like the Zamindars and Jagirdars have been abolished. Even after the abolition of intermediary tenures, tenancy continued on a considerable scale in *ryotwari* areas. Measures have, however, been taken in various states for conferment of security of tenure for tenants. Moreover, consolidation of holdings has been done in most of the States to overcome the problems of scattered holdings. Ceiling on holdings is under progress and at different stages of implementation. Keeping in view the varied agro-economic and climatic conditions prevalent in the country, it has been decided to keep the holding of the family between 4.05 to 7.28 hectares with assured irrigation capable of yielding two crops a

year; a ceiling of 10.93 hectares for land with facilities of irrigation capable of yielding one crop a year; and ceiling of 21.85 hectares for all other categories of land.

### *Cooperative Farming*

Co-operative farming is one in which members (farmers) pool their land voluntarily and manage it jointly under a democratic constitution. The essential feature of co-operative farming is that its constituent members agree to surrender their individual rights and agree to take major decisions in common by a body constituted by them. In cooperative farming, the farmer joins a co-operative mainly for getting services which are beyond his individual capacity. Thus co-operative farming is a voluntary association of cultivators for better utilisation of resources including man-power and land in which a majority of the members participate in farm operations with a view to increasing agricultural production, employment and income. Co-operative farming is based on capitalist methods. It has the usual advantage of large-scale enterprise and leads to large-scale production and better marketing. Its main motive being profit, it suffers from the defects associated with absentee landlordism.

In some of the developed countries like Sweden, Norway, the Netherlands, Belgium and Denmark, the cooperative movement has been very successful. In Denmark, the movement has been so successful that practically every farmer is a cooperative farmer. The importance of cooperative farming in an agrarian country like India is quite significant. Proper land management plays a vital role in the increase of agricultural production. India is, however, predominantly a country of small fields and very small holdings. The pressure of population on the land and the laws of inheritance have resulted in the splitting up of a

large portion of cultivated land into holdings which fail to conform to any reasonable economic standard. The holdings not only tend to become small, but individual holdings are becoming fragmented into a number of plots, often scattered over different parts of the village. These small and uneconomic holdings are a great impediment in the development of Indian agriculture. Co-operative farming, despite certain weaknesses can go a long way in raising the total production and improving the standard of the rural population.

### *Collective Farms (Kolkhoz)*

Since the 1917 Communist Revolution in Russia, radical changes in agricultural practices have taken place in the U.S.S.R. and other Communist countries including Hungary, Romania, Poland, Bulgaria and Czechoslovakia. Collective farming and state farming systems of agriculture have been introduced in these countries. The Communist definition of a collective farm is 'a voluntary productive co-operative union based on social ownership of the means of production and on collective labour which excludes exploitation of man by man.'

A collective farm is an economic community of farming families who pool their resources and undertake to work together under a management committee chosen by themselves. This committee is responsible for farm management, the allocation of work, the distribution of income in kind and cash and the disposal of surplus produce. All the working members are placed in labour groups (or brigades) and work is allocated on a group basis. The remuneration of collective farmers is calculated in 'work day units' i.e. the value of the average amount of work that can be done by a collective farmer in one working day, as fixed by a standard quota for each type of work. Differ-

ences in skill or special efficiency are remunerated by upgrading some jobs to a higher equivalent in 'work day units' than others. Each collective farm has to sell the produce to the State at a prescribed rate, a fixed portion of what is assumed to be an average yield.

In the agriculture of Russia the two major units employed are the collective (Kolkhoz) and state (Sovkhoz) farms. The land of the collectives is leased in perpetuity to the collective as a unit and is worked under the direction of a committee, selected by the members of the collective. All equipment, livestock and buildings are owned by the collective. Initially there were no wages as such and payment to the members was made in the form of cash or agricultural produce or both, and was calculated in 'work day units.' These took account of the work done, the time spent and the skill required. Since 1966 they have moved a system of guaranteed monthly cash payment. This ensures payment, whereas in the earlier system payment was only made if there was a surplus. Other commitments had been made i.e., state requirements of produce, tax and prices, new equipment, pension and cultural funds. Members of collective farm retain small plots of land and a few livestock for their own personal use. This system is tolerated rather than encouraged, but its value in the agricultural economy cannot be denied. The collectives are highly mechanised and in this connection a very important part is played by the Machine Tractor Stations (MTS), maintained by the State at suitable places. These stations keep tractors, combines and harvesting machines for the use of collectives which pay in kind at a fixed rate for their services. The average size of collective farm in the Soviet Union varies from 250 hectares in the West to 2000 hectares in the South Central

Siberia and Kazakhstan.

### *State Farms (Sovkhoz)*

The state farms in the Soviet Union are owned and operated by the state and their workers are paid employees. State farms are run on highly mechanised basis and obtain the benefits of large-scale organisation. These farms are generally larger in size and are employed in developing new lands. They engage themselves in specialisation and research. They have the role of leading and improving agriculture in the Soviet Union. However, there are more collective farms (Kolkhoz) than the State farms (Sovkhoz). State farms tend to be specialist or research units while collectives grow the bulk of Russia's produce. In collective farming the part played by plots allotted to individual farmers is very significant. Their produce consists mainly of potatoes, vegetables, meat, milk and eggs and their share in the total national production is significantly high. There is the ever-present problem of workers neglecting the communal work in favour of working in their own plots.

The difference between the collective farms of Russia and cooperative farming is quite significant. Cooperative farming is a democratic institution managed by the members themselves without any state control or direction. The land of the society is taken in freehold or lease-hold. It is open to a member of a cooperative society to resign from the society and after due notice receive a refund of any capital he may have subscribed. A collective farm on the other hand, though managed in a democratic form is largely controlled by the state, which makes it serve the overall needs of national production and follow price policies as determined by the state. The state lays down the production programme of a collective farm as well as a rigid policy for the greater part of the market-

able produce of the farm.

### IRRIGATION AND FLOOD CONTROL

Irrigation has been defined as the application of water to soil for the purpose of supplying moisture which is essential for plant growth. It provides insurance against short duration droughts. It cools the atmosphere, making the environment more favourable for the germination, growth and development of various crops. Moreover, it softens the soil for tillage.

Irrigation is an age old art. In history, civilisation followed the development of irrigation and civilisations have risen on irrigated lands. Although irrigation is of first importance in the arid and semi-arid regions of the world, it is becoming increasingly important in the humid regions also. Areas requiring irrigation are extensive and lie in both the hemispheres. In the northern hemisphere irrigation for crops is required in a belt extending across the Western parts of the United States and Mexico, Spain, France, Italy, Greece and Asia-minor, thence over South-West Asia, Pakistan, India, South-East Asia and China. The Southern arid belt encompasses the portion of South America on the West side of Andes mountains and the Southern parts of Africa and Australia. Some of the most profitable irrigated agricultures in the world are located in areas normally thought to have sufficient rainfall. Such areas consist of Central Brazil, Central America, West Indies and the Western parts of Africa, all of which have ample rainfall.

Water for irrigation is available from a number of sources. They are perennial streams, seasonal rivers, springs, tanks and underground water-tables. Rain water is the cheapest source of water, provided it is timely and adequate in amount. But unfortunately in a greater part of the world, rainfall is

uncertain and highly unevenly distributed. Failure of rains have brought repeated famines in many areas of the world. Indian farmers like others have often suffered on account of the failure of rains.

One of the most important advantages of irrigation is that it prevents famines. It is one of the strongest agencies in promoting civilisation. Irrigation helps people to live a settled life in peace with mutual cooperation (in the making of dams and canals). It helps people to live together. Thus irrigation, on the one hand makes the occupation of agriculture more certain and reliable, giving high agricultural returns even in areas of arid and

semi-arid climates where rains are most uncertain and on the other it promotes civilisation. Still there is no precise and uniform data available on the scope of irrigation in the world. It has however, been estimated that about 156,000,000 hectares of land is irrigated. The Food and Agricultural Organisation (FAO) data, supplied by each country, indicates that the largest areas under irrigation are located in China, India, Pakistan, Soviet Union and the United States. Asia excluding the Soviet Union irrigates about 73 per cent of the total irrigated area of the world, while the United States and Russia's share in the total irrigated land is 8 and 5 per cent respectively.

## EXERCISES

### Review Questions

1. Differentiate between the following :
  - (a) Shifting and sedentary agriculture.
  - (b) Subsistence and commercial agriculture.
  - (c) Intensive and extensive agriculture.
  - (d) Mixed farming and dairy farming.
  - (e) Horticulture and plantation.
  - (f) Mixed farming and mixed cropping.
2. Explain the following with suitable examples:
  - (a) Cooperative farming, (b) Collective farming, (c) Individual farming.
3. Explain any two of the following :
  - (a) Large-scale mechanised grain cultivation results in low yield per acre but high yield per man.
  - (b) Regions of intensive subsistence paddy agriculture are often associated with poverty and overpopulation.
  - (c) Shifting cultivation is not going to last long.
  - (d) Wet-paddy cultivation is confined to the South-East Asia.
4. Shifting cultivation is the most appropriate type of farming in the interior parts of tropical and sub-tropical forests. Explain.

5. What difficulties hinder in intensification of shifting cultivation
6. Irrigation is by no means confined to areas of arid and semi-arid climates. Discuss.

### Find out

1. (a) Locate the farms in your neighbourhood which practise intensive or extensive farming.
- (b) Visit a modern dairy farm and record its operations.
- (c) Collect information about the Bhakra Nangal Dam.

### Cartographic Work

- 1 Show the following in the world outline map :
  - (a) Areas of shifting cultivation.
  - (b) Areas of intensive subsistence agriculture.
  - (c) Areas of mixed farming
  - (d) Areas of commercial and nomadic grazing.
  - (e) Areas of plantation agriculture

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## CHAPTER VI

# Major Crops

A fundamental feature of every culture lies in the way food is produced, distributed and consumed. At present, practically everything we consume is the product of a process or a sequence of processes that begins in the earth itself. A great majority of the world's people today are sustained chiefly by the major grain crops, the cereals.

### RICE

Probably about half the people of the world depend upon rice for their daily sustenance. It is the staple food not only in Monsoon Asia, but also in other tropical and sub-tropical areas where physical and climatic conditions permit its cultivation. It is a dominant crop in tropical and monsoon lands and flourishes in a variety of areas such as flood plains, swampy deltas and irrigated lowlands. It is also successfully grown in the warm temperate lands of both Southern Europe and the United States (Fig. 10).

#### *Rice as a Diet*

As a food grain, it is more nutritious in the unpolished state but more palatable in the polished or milled form which dieticians have found to be deficient in food value. It is low in both protein and fat content and contains practically no Vitamin C. Most of

the mineral nutrients are present in the grain and the outer-layer of the rice and not in the starchy endosperm. Milling, polishing, washing and even cooking remove much of the vitamin and mineral content (especially Vitamins A and B and calcium), so that cooked rice forms a very unbalanced diet. As a result, deficiency diseases such as beri-beri are common where polished rice is the staple food. Diseases such as stomatitis, glossitis and cheilosis are also common in the South-East Asia, though not in serious form. Further the dense population of Monsoon Asia also creates problems of rice shortage and leads to famine and starvation. In many areas dependent on rice, therefore, people are not only undernourished but also inadequately fed. This partly explains the low level of health in South-East Asia, the higher mortality rates and the low level life expectancy rates as compared with areas where wheat is the staple food. If people could be persuaded to eat unpolished or parboiled rice, together with the usual amount of fruits, vegetables, fish or meat, the dietary position in the Orient could be improved. However in recent years many tropical countries have been consuming an increasing amount of wheat and bread which will help to correct the unbalanced diet of the rice-lands. The Green Revolution

has reduced the threat of famine.

The earliest centre of rice cultivation was probably in India, from which the crop spread to China and the lower valley of the Euphrates. Throughout its history, rice cultivation has spread into hot, wet regions without going far outside the tropics. It prefers a mean temperature of not less than  $20^{\circ}\text{C}$  and soil saturated with water at least at the beginning of its growth. These biological features fix it, therefore, in wet tropical regions in general in plains where irrigation is possible when the rainfall is not adequate. There are more than 200 varieties of rice distinguished by the appearance of their inflorescence and their adaptation to certain soils.

Upland rice has a short stem and small grains which are sometimes coloured red. It is harder than plain rice and is satisfied

with rain water. There is an infinite variety of plain rice to be adapted to a great diversity of natural conditions.

Throughout its growth, rice demands great attention, and this calls for a great deal of labour. Fortunately, its enormous yields make extraordinarily large concentrations of labour possible. There are great variations in the way in which rice is cultivated. Nonetheless some generalisations are possible. First, farms and fields are invariably small and widely scattered. The typical rice farmer has only one or two hectares. In Japan the average rice farm consists of fifteen separate fields and in Southern China six.

Most wet rice farms are operated by family labour alone. The very rapid growth of population in rural Asia in the present century has, however, created a class of landless

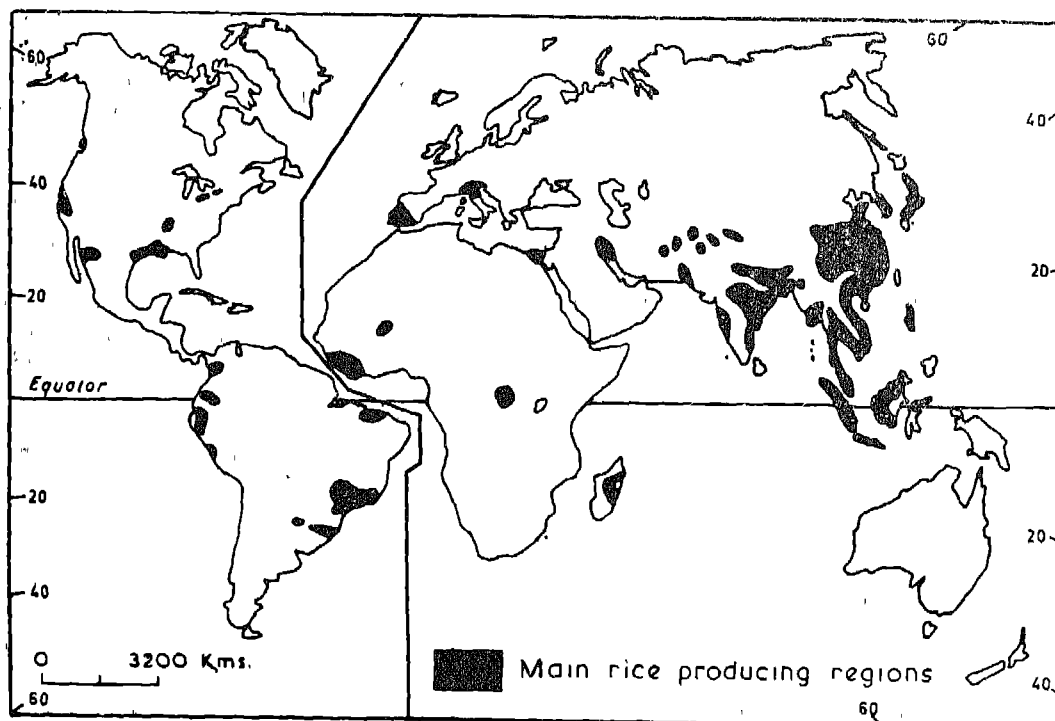


Fig. 10

labourers who are sometimes hired in the critical periods of sowing and harvesting. The exception to this is Japan, where mechanisation has syphoned off the surplus rural labour. India has a longer history of landless labourers, for lower castes were not allowed to own land, and often supplemented their living by working on farms.

Wet-rice farmers are usually described as subsistence farmers, and indeed about one-half of the world's rice is consumed on the farms where it is produced. Most rice growing areas support very high densities of population; for example, parts of the Ganga-Brahmaputra and Tonkin Deltas, together with a few areas in Java, have densities of more than 1500 persons per sq. km. The average density in the delta lands of Bangladesh exceeds 390 persons per sq. km. and a few parts of the lower Ganga plains in Bihar and West Bengal have less than this. The state of Kerala has an average density of 428 persons per sq. km. Densities are even higher when the total population is related to the cultivated area, that is, the nutritional density.

One of the most distinctive features of wet-rice farming is the intensive use of land, the high inputs of labour. At the beginning of the agricultural year (i.e., arrival of the summer monsoon), dykes, bunds and canals have to be repaired. Attention is then turned to the preparation of fields, the soil has to be reduced to a muddy consistency before the seed is sown. This is done with the help of a plough drawn by buffalo or oxen. Draught animals are less in East Asia than in the Indian sub-continent.

Rice seed is not usually drilled, and is thus either 'broadcast or transplanted. Transplanting is by far the most common method of rice cultivation. In some parts of India, Bangladesh and Sri Lanka its cultivation is also carried on by the broadcast

method. However, the traditional method practised in most of the South-East Asian countries is to raise the seedlings in the nursery first and then transplant them into the field after about 40 days. The nurseries are well manured with organic materials and the seed beds are moderately wet. In regions where the advent of rainy season is uncertain, a dry nursery is used. In this case the young seedlings can remain in the dry nursery for as long as 70 days until the rain comes.

The preparation of fields for transplantation is thoroughly made. When the young plants in the nursery reach a height of 25 to 30 cms, they are planted in the paddy field. This field in the meantime, has had much treatment in the shape of ploughing and harrowing carried out under water. When the paddy field has been transformed into a pool of mud, the planting is proceeded with. It is a long, painful operation, requiring many hands. As a rule the plants are taken from the seedbed by men, but the planting is done by women. It has been reckoned that in India and China a team of 12 people is needed to plant one acre of paddy field in one day. In most places the yield of rice from transplantation is greater than that from broadcasting. In fact transplanted rice grows faster because of the regular spacing and matures within a shorter period.

After transplanting, the young seedlings are allowed to grow for about 3 to 4 months till harvesting time. Meanwhile some care is given to the field, such as an occasional weeding and thinning out more crowded patches. The farmers also take note of the level of the water in the paddy-field. If the amount of water in the field falls short of requirements, irrigation water is supplied to the crop. The growing rice plants are regularly inspected for fungus disease and insect pests, and, where necessary, insecticides are employed to eliminate them.

While the plants are growing, they must be given a second dressing of fertilizers and weeded so as to ensure that the water enters the soil well and to get rid of parasites. Above all it is essential to maintain control of the water. Upto 10 to 15 days before the harvest, the soil should be alternately flooded and left to dry. Rice is reaped with a hand implement—a sickle. When cut, the blades of rice are tied in little sheaves, which then are fastened and transported to the village. The straw is used to feed animals, to thatch the peasant's houses, and sometimes as fuel.

Rice is thrashed in several primitive ways. Sometimes it is trodden under the feet of buffaloes and oxen, elsewhere it is separated from the stalk by beating it on a wooden-wheel of a cart and in some places gins or flails are used. Threshing is normally done in the paddy field itself to minimise transport and to reduce loss in weight of the grain. After threshing the husk from the paddy is removed so that white or polished rice is obtained. The traditional way in many of the villages in South-East Asia and Africa is to hit the grain in a wooden mortar with a heavy wooden log or hammer. In Northern India this is known as *moosal*. This method is not only slow but results in a high percentage of broken rice. Modern milling is, however, entirely machine operated. Some large rice mills can handle a thousand tons of rice in a day. Rice mills are located in rich 'rice bowls' or in large ports.

### World Production of Rice

The peculiar requirements of rice in respect of climate, water and soil mean that its cultivation is concentrated in the lowlands and terraced hill-slopes of the humid tropics, especially Monsoon Asia. It is grown mostly in China, India, Japan, Bangladesh, Pakistan, Indonesia, Vietnam, Taiwan, Burma,

Malayasia, Korea, and Luzon (Philippines). Outside Monsoon Asia, it is grown in Egypt, Brazil, the U.S.A., Italy, Spain, Turkey, the Rhone Delta of France and the U.S.S.R. (Fig. 10)

### China

In China, paddy is grown mainly in the warmer South in the Yangtze and Sikiang Basins, the South-East coastlands, the Szechwan Basin and the hill slopes South of the Yangtze Kiang. About one-third of the total production of rice of the world is produced in China.

### India

India accounts for 21 per cent of the world total. About 25 per cent of India's cultivated land is under rice, and the annual output is about 80 million tons. It is the staple food in all the wetter parts of India where rainfall exceeds 1525 mm. (60 inches). In regions of lower rainfall e.g., Western Uttar Pradesh, Haryana and the Punjab, rice is grown with the help of irrigation or it gives way to millets. The major rice producing regions of India are the middle and lower Ganga plains, Assam valley and coastal lands of peninsular India (Fig. 11).

### Japan

The Japanese are well known as the high yield producers of rice. They have introduced high-yielding 'Japonica' paddy hybrids which increase output tremendously. Some of the fast maturing species that the Japanese have introduced can be harvested within 90 days.

Wet-paddy occupies about half the cropland of Japan, mainly in the South in Kyushu, Shikoku and Southern Honshu. Double cropping is practised in the extreme South in irrigated alluvial lowlands. Elsewhere rice is single cropped. However, the trend in Japan

is towards greater wheat cultivation as wheat is more nutritious and commands better prices.

In Bangladesh rice fields are in the Ganga-Brahmaputra Delta region, where the annual rainfall is more than 2030 mm. (80 inches)

In Indonesia about 8 million hectares are under rice, mostly in Java and wherever the annual rainfall is 1525 mm. (60 inches). It is cultivated as either wet-paddy or dry-paddy. It is intensively cultivated and the terraced mountainous slopes produce 5 per cent of the

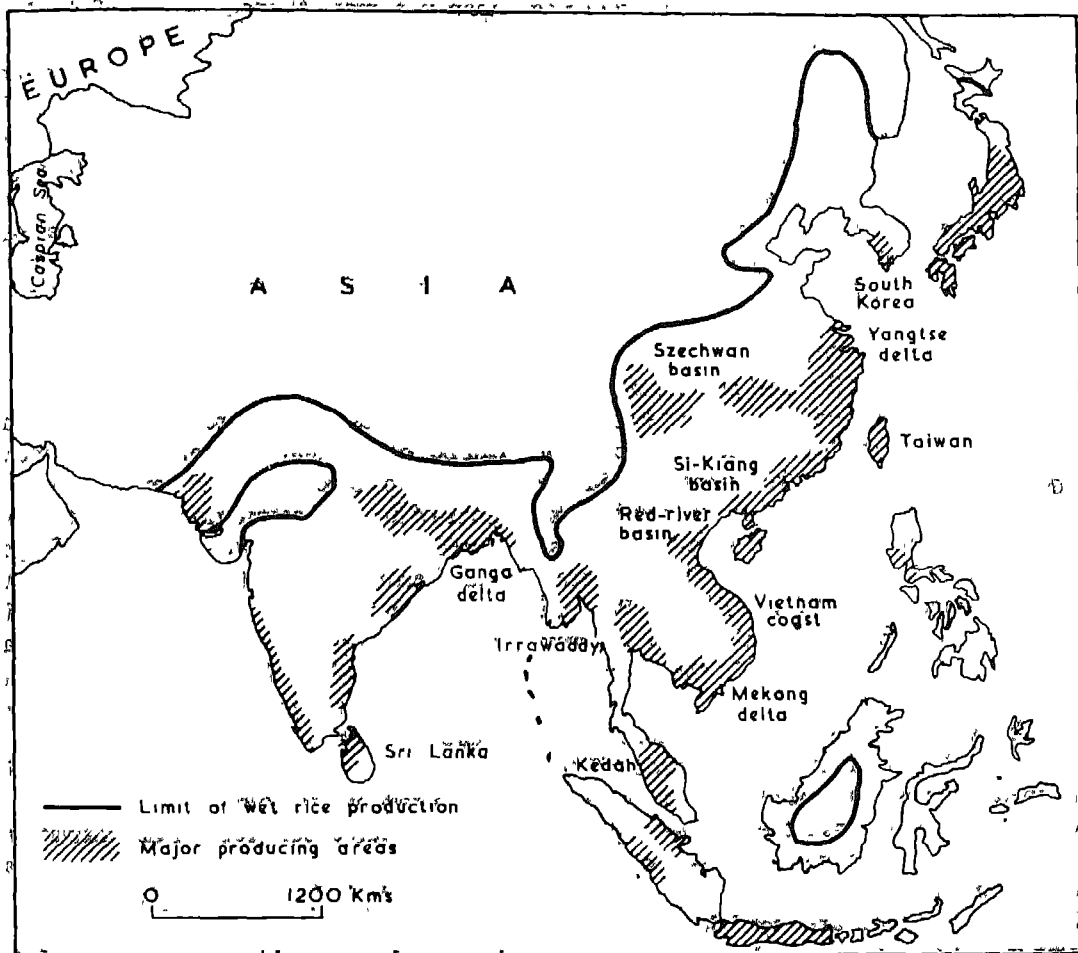


Fig. 11.

and the soil is heavy and wet all the time. Some rice is also grown in Punjab and the Indus Delta in Pakistan under perennial irrigation from the modern multipurpose dams, constructed on the river Indus and its tributaries. (Fig. 11).

total rice crop. (Fig. 11).

Outside Monsoon Asia, relatively little rice is grown. In Egypt, rice is grown both in the Nile Delta and Valley, and is the chief food grain of the Egyptians. Brazil is the largest rice-growing nation in the Southern

continents. Paddy is grown mainly in the South-East Brazil where the heavy precipitation, the swampy coastal lowlands and high temperatures make the area ideal for wet-paddy cultivation.

The U.S.A. produces about 2 per cent of the world's rice. The leading rice producing states are Louisiana, California, Texas and South Carolina.

In Europe, paddy farming is only of some significance in the North Italian Plain, the Ebro-Basin of Spain and the Rhone Delta of France. The U.S.S.R. also produces some paddy. European paddy cultivators achieve the highest yield per acre in the world, i.e., 5,500 lb per acre (6,100 kg per hectare).

#### WHEAT

Wheat is one of the most popular of human foods. Its high protein and carbohydrate contents, superior quality grain and ease of storage and handling make wheat a valuable food crop. Its precise origin is not known. It probably originated in Asia-Minor, gradually spreading across the Mediterranean to the European countries. From the Western Asiatic province it has also won its way into the New World and the Southern Hemisphere.

Though wheat cultivation is concentrated mainly in the mid-latitude grasslands of the temperate zones, wheat is also grown in many other climatic regions: the warm-temperate, Mediterranean regions, China-type region, the tropical Monsoon areas, the savanna lands, the desert and semi-desert margins with irrigation. It can even be grown on equatorial uplands as in the Andes, provided the uplands are cool enough and not too damp.

The successful ripening of wheat needs a fairly great amount of heat and drought to allow accumulation of starch in the grain. In the early stages of growth it requires a fair amount of

moisture with cool weather to be followed by warm and sunny weather without any rain. Just before the ripening of the grains, a little rain is helpful but when it is ripening clear and bright days are required. Most of the world wheat producing regions have less than 1000 mm. (40 inches) of rainfall. In the areas of deficient rainfall its cultivation is carried on employing dry farming methods. Wheat can be grown even in regions with as little as 200 mm. (8 inches) of rainfall. Irrigation in such areas is often used to supplement water supplies. Actual water requirements of wheat also depend on several other related factors such as the rate of evaporation, the amount of water percolation or drainage, the prevailing winds, the general topography and the moisture content of the soil.

An excess of moisture and too much heat can be detrimental and make the wheat vulnerable to diseases. This explains why regions of heavy precipitation such as the rainy tropics or the wetter parts of Western England and Ireland grow little wheat. Moreover, wheat cannot stand great cold, but thrives in mild winters which promote tillering and allow profitable cultivation of winter varieties. It seldom grows in northern regions where the thermometer falls below  $-4^{\circ}\text{C}$ . In Soviet Asia and Canada the crop has failed many times due to cold.

The suitable soil for wheat cultivation is either light clay, clayey-loam or heavy loam, which is relatively stiff and gives the plant a firm support. Moreover, the soil should be deep and permeable. Lime is needed to produce fine quality grain: phosphate is indispensable for the development of many grains in the ear. These requirements explain the success of the crop on plains rather than on uplands. The world's largest produce of wheat comes from the chernozem

(black-earth) soil of the Ukrainian steppe and Canadian Prairies. The dark colour of this soil is due to the large reserves of decomposed organic material (humus) built up through generations of grass-rotting. Terraced wheat farming is unusual, except in China, Japan and Himachal Pradesh (India).

Through generations of selection and cross-breeding, hundreds of varieties of wheat have been devised to suit local conditions and demand. There are also differences in the length of time needed to reach maturity, the degree of resistance to drought, cold, fungus disease, insect-pests and grain loss in high winds. Varieties of wheat are grouped according to their hardness and softness and growing seasons.

#### *Winter Wheat*

The wheat sown in late autumn or winter and harvested in early summer is termed winter wheat. It is usually grown in regions of the middle latitudes where winters are mild and cool, but sufficiently damp and without severe frost. The seeds lie dormant in the winter, grow rapidly in the cool wet spring and the crop is harvested in the early summer. About 80 per cent of the world's wheat is winter sown.

#### *Spring Wheat*

Wheat, which is sown in the spring is known as spring wheat. Spring wheat is grown in the colder north of the Canadian Prairies, where temperatures may drop to 16 to 22°C below freezing point, and in parts of the continental steppes and Siberia. In these areas, seeds can only be sown after the severe winter is over. The wheat grows through the cool moist spring and is harvested in late summer or early autumn.

Both winter and spring wheat may be either hard or soft. The hard wheat has

a low moisture content and is best suited for bread-making. The soft wheat with a higher moisture content is more suited for making cakes, biscuits and pastries.

#### WORLD PRODUCTION

There are over 220 million hectares of arable land under wheat cultivation, and the annual harvest is estimated to be 300 million tons. The major wheat producing regions of the world lie in Europe, North America, Siberia, China, South Asia and in small pockets in the Southern continents (Fig 12).

In Europe wheat is extensively grown. There are, however, in the continent two groups of countries, in each of which wheat cultivation plays an entirely different but important role. The North-West Europe which is probably the least favoured part climatically is nonetheless a great producer, because here wheat cultivation takes an intensive form with the highest yields in the world. In some countries like the United Kingdom, Belgium, the Netherlands and Denmark, cash crops or pastures have ousted wheat over wide stretches of arable land. France, however, has stuck to its cultivation, and, at present, is one of the leading producers of wheat in the world (Fig 12).

Countries in the South and East of Europe have the great advantage of a dry climate, but nonetheless they are far from attaining to the yields in North-Western Europe. Mediterranean lands of Europe, including France, Southern Italy, Greece, Spain and Southern Portugal, produce excellent wheat, but their lowland and plain areas are few and small, their cattle too few in number to give plenty of manure, and drought places great uncertainty on the harvests. The steppe lands of Eastern Europe from Hungary to the Volga have enormously increased their production in the present century. In this area wheat is a

commercial crop and in many areas cultivated in the form of monoculture. In the Soviet Union wheat production has increased continuously, more by sowing a greater area than by raising the yield (Fig. 12)

continent. Up to the beginning of the nineteenth century the major wheat growing area of the U.S.A. was between Virginia and the Lake Erie. The opening of the route to the West resulted in the invasion of the Prairies by wheat

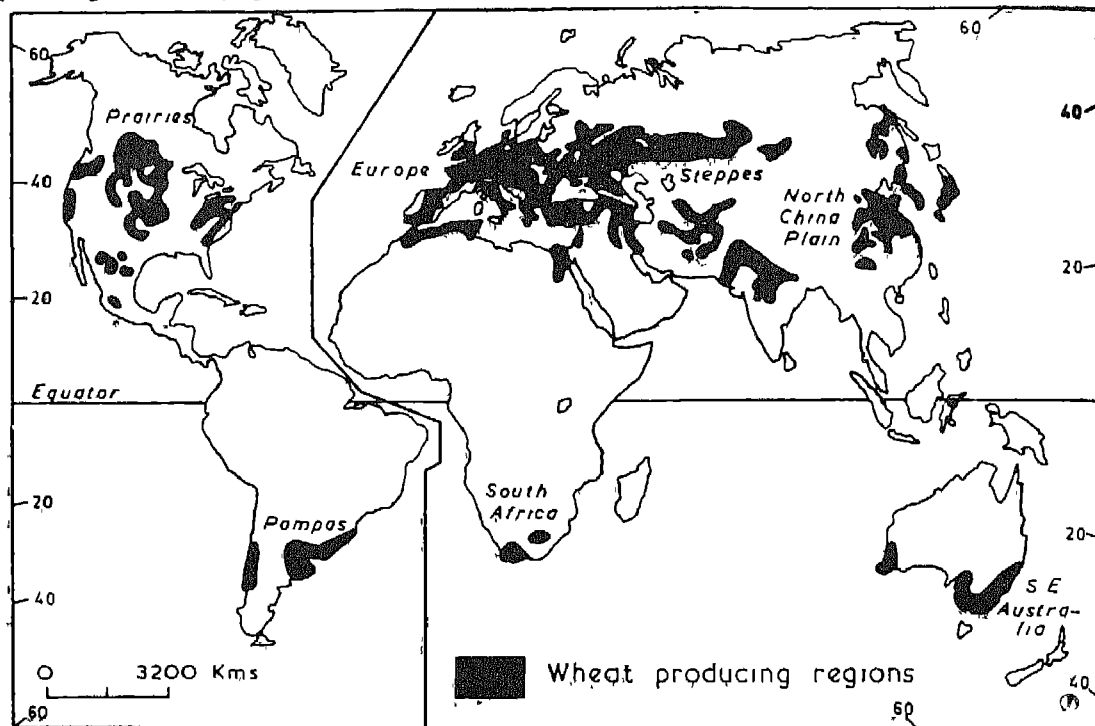


Fig. 12

The loess plains in the Northern Chinese provinces are one of the largest wheat producers in the world. In China wheat cultivation is done mostly by the indigenous methods with more manual labour. With the introduction of mechanical equipments like that of the Soviet Union, the U.S.A. and Canada, her agriculture might have a long lead in world wheat production.

North America is another important wheat producing region of the world. The warm summer and good rainfall in spring, together with fertile plains of glacial clay have been favourable to the spread of wheat all over the

fields. This migration westward was easily followed by the displacement of milling centers. At present over two-thirds of the U.S. wheat harvest comes from the North and South Dakotas, Kansas, Minnesota, Nebraska and Montana. The same migration from East to West is seen in Canada. It is to the Prairies, which are northward continuations of the wheat lands of the United States. In the U.S.A. and Canada, most of the wheat is grown on commercial grain farms of several hundred acres, sometimes more than a thousand. In the Great Plains of the U.S.A. the whole operation of wheat cultivation has been

mechanised so that farmers can do their own planting. The harvesting however is done by professionals who own huge combines for threshing the wheat. These professional harvesters travel northwards as the wheat ripens, starting in Texas in May and finishing up in North Dakota in September.

In the Southern Hemisphere wheat has found favourable physical and socio-economic conditions in the Pampas of Argentina and Uruguay. On these wide plains with fertile soil and dry climate, large quantities of wheat are grown. Argentina is an exporter of wheat while Australia has devoted to wheat cultivation the grasslands which have dry climates. The harvest is uncertain and, therefore, irrigation for the crop is necessary in most parts of Australia. For this reason the area devoted to wheat is decreasing and there is less production of wheat on the plains on the Eastern side of New Zealand. Australia is, however, a leading exporter of wheat in the world. In Africa, wheat is of little importance, except in the extreme South parts of the Cape province and in the North African states of Egypt, Morocco, Algeria and Tunisia (Fig. 12). In all these areas the semi-arid climate makes the yield of wheat very low.

In India and Pakistan wheat is grown as a winter crop in regions with less than 1015 mm (about 40 inches of rainfall). The cool winter, the occasional rains from the Western disturbances and the alluvial soil of the Great Plains of India are conducive to the cultivation of wheat. The provinces of Punjab, Haryana, Western Uttar Pradesh, Gujarat and Madhya Pradesh are the major wheat producing areas of India. In Pakistan its cultivation is confined to the province of Punjab. In both India and Pakistan wheat is grown with the help of irrigation done by perennial canals and the tubewells.

### SUGARCANE

Sugarcane is the chief source of sugar which is an important ingredient of our food. It readily supplies the necessary heat to our body. It is a tropical crop, which grows well in areas with temperatures between 70°F and 80°F. A long rainy season of about eight months duration in summer with about 1500 mm. (60 inches) rainfall and a cool-dry winter season during ripening and harvesting are ideal. Frost is detrimental to cane and as such its cultivation is limited in the frost free areas of the world. Very heavy rainfall results in cane of low sugar content and a rainfall deficiency produces fibrous cane. Deep, loamy and well drained soils are ideal for sugarcane cultivation. Calcareous soil favours the vigorous growth of cane. The crop requires heavy doses of manure and fertilizer. An abundant supply of cheap labour is also essential as much of the sugarcane operations, e.g., ploughing, sowing, irrigating, cane-cutting and carrying to the factories are done by manual labour. The cane plant is subject to many diseases and attacks from insects throughout its growing period, and therefore needs careful attention to prevent deterioration in quality.

Sugarcane is grown with a considerable variety in practices. In India, where mostly 'gur'—the unrefined brown sugar—is produced for local consumption, the crop is commonly grown on small holdings. In contrast, sugarcane is generally grown in Hawaii and Cuba, both large producers, with a plantation system of agriculture.

India is one of the leading producers of sugarcane which contributes 19 per cent of the world total of sugar. In India, sugarcane is grown mainly in Peninsular India, in the states of Karnataka, Tamil Nadu and Andhra Pradesh, and in the Ganges Valley. In India, especially in the Great Plains, irrigation is

often used for sugarcane cultivation. In Pakistan sugarcane is grown in the provinces of the Punjab and Sind with the help of canal and tube-well irrigation. China grows sugar cane for local consumption, the main areas being the warm South of the country in the Sikiang Basin. In South-East Asia, the Philippines is now the leading grower. Indonesia was once an important producer—most of the crop coming from Eastern Java—but the crop has declined and Indonesia is now an importer of sugar. Malaysia, Burma, Thailand, Cambodia and Vietnam also produce sugar for local consumption. Taiwan, despite its small size produces a large surplus for export mainly to Japan (Fig 13)

Cuba is the leading grower of sugarcane, the main sugar areas being along the Northern coast and East of Havana. Sugarcane is the

backbone of the island's economy and the well being of the country depends on sugar export. The industry is served by more than 160 sugar mills, but the output tends to be seasonal and this affects not only the running of the mills, but also a large proportion of the country's workers, who depend on harvesting sugar for their livelihood. Before the Cuban Revolution in 1959, the main export market was the U.S.A., but since the Communist revolution most of the sugar has been sold to the U.S.S.R. (Fig 13)

Other important Latin American producers are Mexico, Columbia, Argentina, Peru, Ecuador, Puerto Rico, Jamaica and Barbadoes. In the U.S.A. sugarcane is grown in Louisiana and the Pacific island state of Hawaii. Here the industry is highly mechanised and all the operations from planting to harvesting are

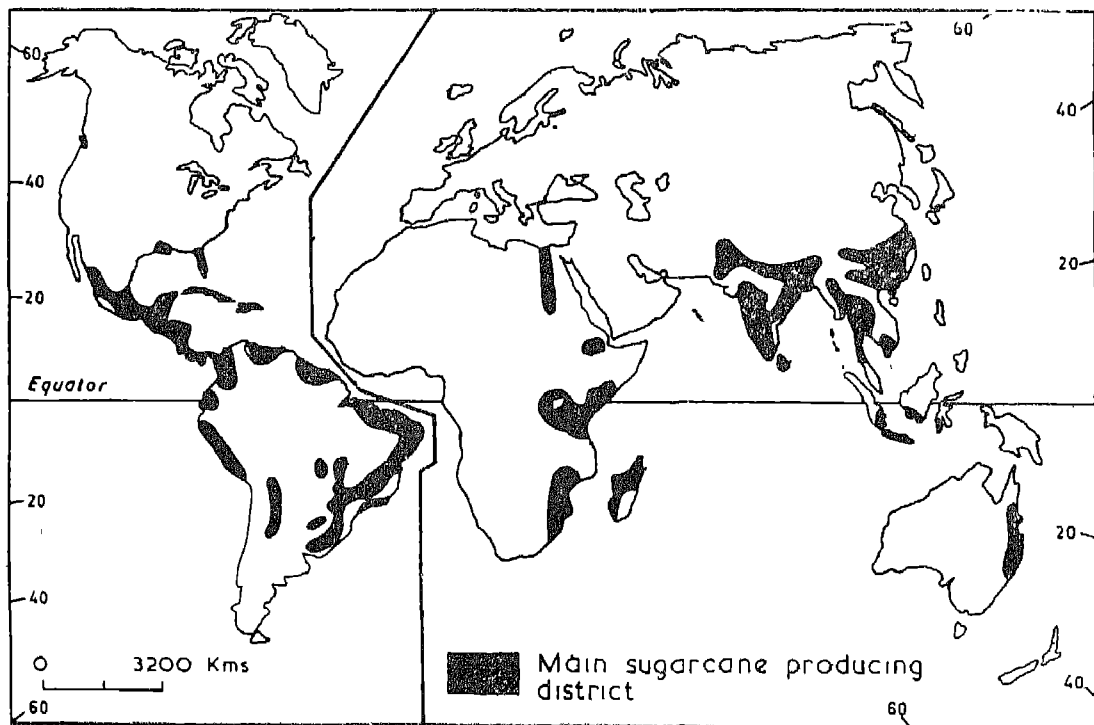


Fig. 13.

done by machines, because of the lack of cheap labour. As a result the cost of production is very high and the industry has to be subsidised.

Sugarcane is also produced in the island of Mauritius in the Indian Ocean and the Fiji Islands in the Pacific. Also in Natal in South Africa sugarcane is an important crop

### COTTON

Clothing is one of the basic needs of man. Various materials e.g., bark of trees, leaves, hides, skins, flax, cotton, jute, hemp and synthetic fibres are being used in the various societies of the world to fulfil this basic need. Of all the fibres cotton is, however, produced in the largest quantity. The use of cotton fibres to make textiles was known to the

ancient Egyptians and cotton has been a major textile in China and Central Asia for centuries. In India the use of cotton has been known for the last five thousand years as is evident from the threads found in the archaeological excavations at Mohenjodaro.

Cotton needs a warm climate with moderate rainfall. Temperatures reaching 25°C or more in summer are ideal. Cooler conditions are preferred at the time of harvest. Cotton is thus cultivated largely in the tropical and sub-tropical areas. A long growing period of at least 200 frost free days is also necessary for the plant to mature as the cotton plant is highly sensitive to frost. About 1115 mm. of rainfall is needed if the crop is to be naturally watered, but it has been found that better crops and better quality fibre can be obtained in semi-arid and even arid condi-

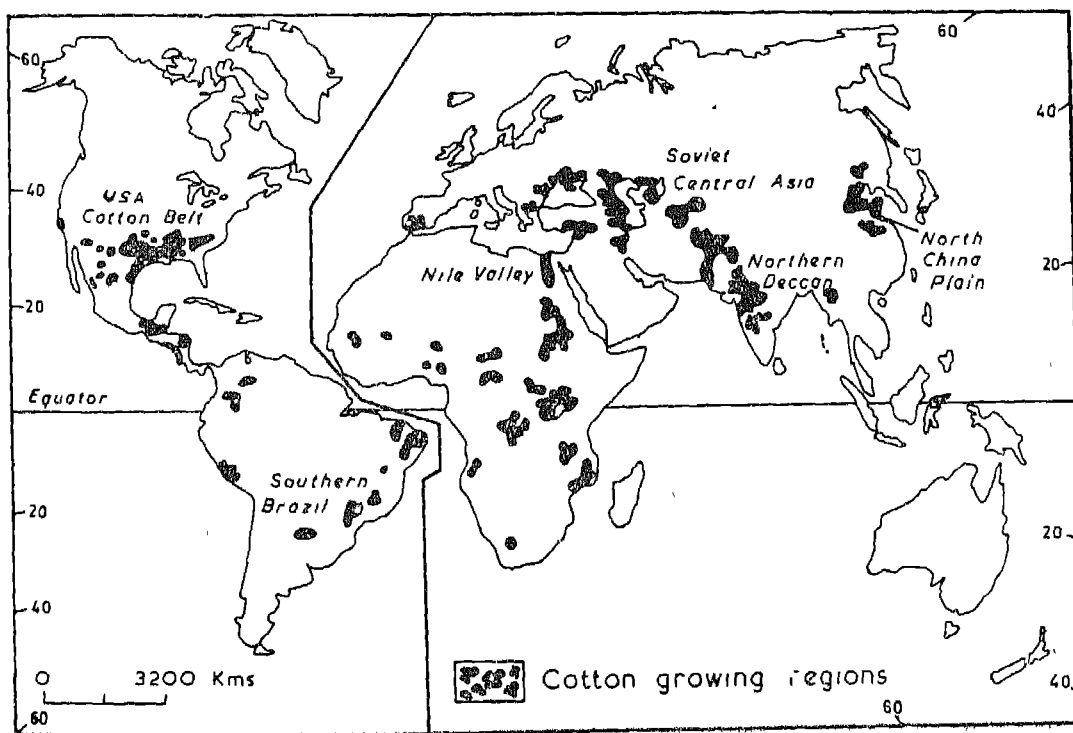


Fig. 14.

tions, with the use of irrigation. Well-drained light, loamy soils, which give the plant good support in windy or stormy weather are ideal. Cotton needs heavy application of manure and fertilizers because it exhausts the soils. Its cultivation requires large supplies of labour as the planting, thinning of seedlings, hoeing, inspection for pests and picking operations require large reserves of man-power.

Cotton cultivation expanded greatly during the nineteenth century, when the Industrial Revolution produced machines for cotton ginning, spinning, and weaving that multiplied productive capacity, brought prices down and put cotton goods in the reach of the masses. The colonial powers laid out large-scale cotton plantations, sometimes under irrigation, e.g., the famous Gezira Scheme in the land between the White and Blue Niles in Sudan. Even today, in spite of the competition from synthetics such as nylon and rayon, most of the cotton produced still finds buyers. In fact cotton goods made at home are cheaper than synthetics, imported from overseas. Moreover, the developed countries have not stopped buying cotton either. Japan, the United Kingdom and West European countries still import large quantities of cotton fibres. The United States sends cotton to Japan and West-Europe. Egypt's cotton harvest also goes to Europe, and countries like Sudan, Uganda and Turkey also compete for the European market.

Cotton grows in many areas of the world, but the major areas of production are relatively few, e.g., the Cotton Belt of the United States, North-East China, Soviet Central and North-Western Asia and the black-soil Deccan Plateau of India. Cotton fields of significance also exist in Egypt, Mexico, in North-Eastern Brazil and in the Punjab region shared by India and Pakistan (Fig. 14).

India grows about eight per cent of the

world's cotton. Cotton is cultivated in Maharashtra, Gujarat, Rajasthan, Punjab, Haryana and Western Uttar Pradesh (Fig. 14). Cotton in India is grown mostly with the help of irrigation and is consumed locally.

### TEA

Tea is the most important beverage crop of the world. Tea is made from the leaves of a tropical shrub, native to the hill slopes of Monsoon Asia. Tea cultivation is believed to have originated in the Yangtze Valley of China as early as the sixth century A.D. It has always been valued for its flavour and qualities as a stimulant and was even used for medical purposes in the past. In Europe, tea drinking was introduced in the middle of the seventeenth century.

Tea requires a deep fertile soil which must be exceptionally well-drained so that there can never be stagnant water in the soil. It is, therefore, generally grown on hill slopes, although it flourishes in well-drained valleys also. The tea plant requires a high temperature of over 21°C during the growing season of not less than 8 months. Abundant rainfall of 2,000 to 2,500 mm. per annum and much amount of moisture in the air is ideal. Its cultivation is, therefore, confined to the tropical and humid sub-tropical regions. Moreover, the tea industry requires an abundant supply of cheap labour as all the picking of the leaves is done by hand and involves a great deal of manual work.

For the cultivation of tea, the land, preferably on hill slopes, is cleared. Tea seedlings or cuttings are raised in a nursery and when the plants reach a height of about 20 cm (8 inches) they are transplanted into the fields. They are usually planted in straight rows, 5 feet apart. Weeding and manuring are carried out at regular intervals.

Frequent pruning encourages the rapid growth of fresh leaves and shoots. The first picking is done at the end of the second year, but full bearing is only reached in the fifth year. The tea shrub continues to be productive for about fifty years, after which replantation becomes necessary.

After the leaves are gathered, they are withered, rolled, partly fermented, dried and sifted. Modern machinery is used for rolling, blending and fermenting the leaves to give them the required flavour.

India is the largest producer of tea in the world accounting for about 35 per cent of its produce. In India, cultivation of tea is carried on in the Assam Hills, the slopes of Himalyas and the Nilgiris. The largest production comes from the Assam Hills and the adjoining areas of the Himalyas. (Fig.

15.) The main advantage in these areas for tea is the abundance of rain, fertile, well-drained soils and cheap labour from the neighbouring densely populated areas.

Sri Lanka is the second largest tea producer. In Sri Lanka commercial tea cultivation was introduced only in 1870. The cool but humid high lands of central Sri Lanka provide ideal geographical conditions for successful tea growing and the tea is therefore of a high quality. Tea is the greatest money-earning crop in Sri Lanka (Fig. 15).

China for centuries was the largest producer, consumer and exporter of tea. In terms of acreage and production, China is still very important but her exports are much smaller than those of India and Sri Lanka. In China tea is grown mainly in

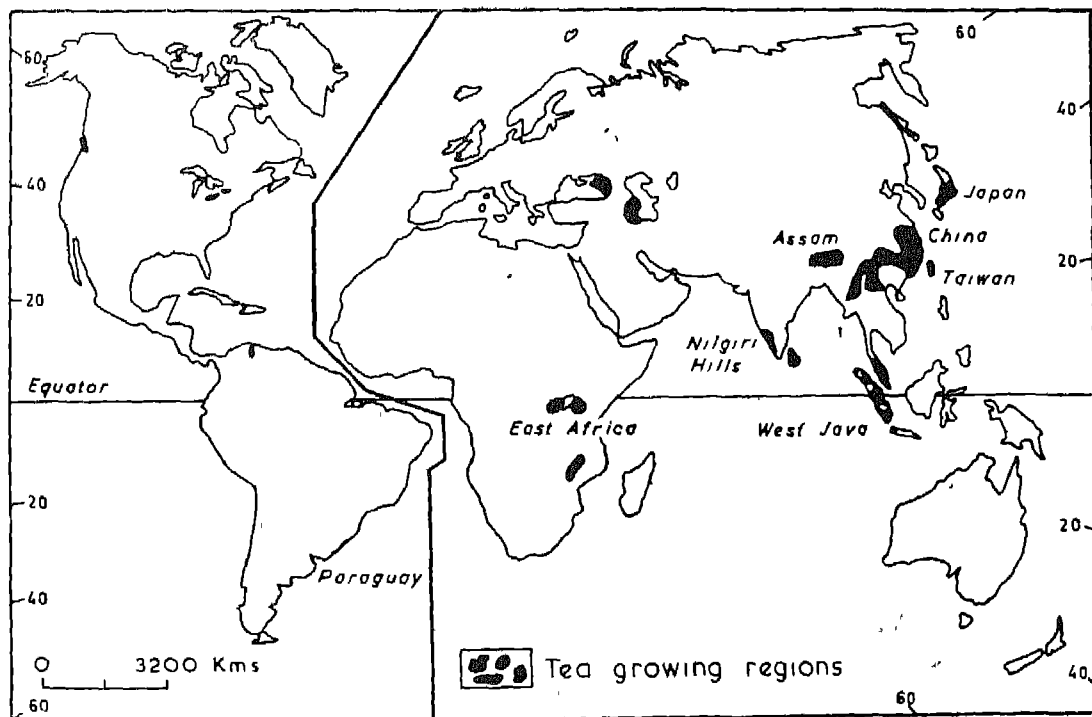


Fig. 15.

highland areas, especially in the Yangtze Valley and Szechwan Basin. (Fig 15). Tea is raised mainly for the home market and, as green tea is produced, less processing has to be done. Among the other producers of tea, Japan and Indonesia are noteworthy but most of their produce is consumed locally with little export. Outside Monsoon Asia, Kenya, Malawi, Uganda, Mozambique are the chief African producers of tea (Fig. 15).

#### COFFEE

The coffee plant, a sub-tropical evergreen shrub of African origin is cultivated for its seeds, which are roasted, ground and sold for brewing coffee. The beverage is consumed either hot or cold by about one third of the people in the world. Its popularity can be attributed to its invigorating effect which is produced by the caffeine it contains.

Wild coffee plants, probably from Kaffa (Ethiopia) are known to have been taken to Southern Arabia and placed under cultivation in the fifteenth century. During the sixteenth century, coffee was introduced in the countries of Europe. With the increasing popularity the plant spread rapidly to Sri Lanka, Java, Indonesia, Haiti, Surinam, Brazil, Jamaica, Cuba, Puerto Rico, Costa Rica, Venezuela, Mexico, Columbia and the Hawaii Islands.

Coffee has two main species, i.e., Arabica and Robusta. The Arabica species of coffee are cultivated mostly in Latin America and Robusta dominates in Africa. In India and Indonesia both the species of coffee are cultivated.

Coffee does well in hot climates and has been known to survive in day temperatures of over 32°C (90°F) in the Arabian penin-

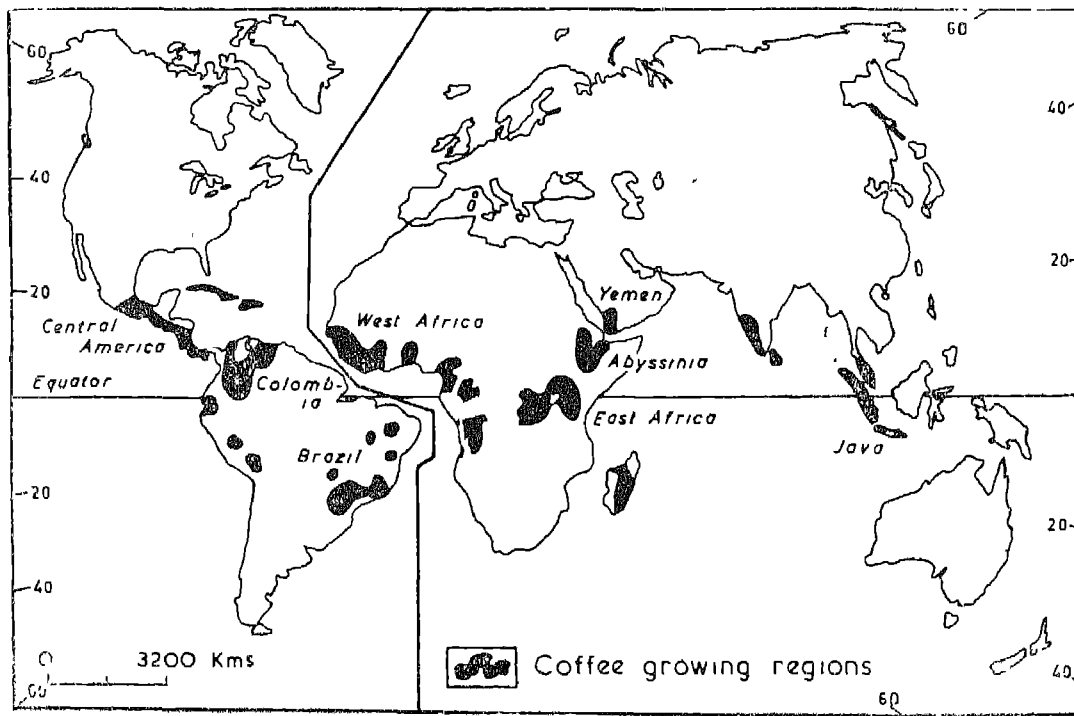


Fig. 16

sula. However, coffee is usually grown in highland conditions where mean monthly temperatures range from 14°C to 26°C. Growth is most rapid during the hot rainy season and bright sunlight and warm weather are necessary for the harvesting and preparation of the berries for export. Mean monthly temperatures should not fall below 11°C in the coldest month.

It needs abundant moisture 1,016 and 2,030 mm. of annual rainfall, but cannot tolerate stagnant water. Well-drained hill slopes which receive orographic rainfall are thus ideal for coffee growing. Irrigation is required where rainfall is less than 1,000 mm. Coffee is a soil exhaustive crop and therefore, virgin soils, newly cleared of forests, give the highest yields because of the high humus quantity in the soil.

Coffee is propagated from seeds or cuttings in a nursery and, after about six months, it is transplanted to the field. Plants are positioned 3 metres apart and grow rapidly. They are pruned annually to ease picking and to ensure heavy bearing of coffee berries. Coffee picking is done by hand by removing the ripe berries from the stalk. The ripened fruits of the coffee shrubs are processed. With modern cultivation methods the average yields of coffee are in the order of 800 to 1,200 kg. per hectare for Arabica Coffee and 1,000 to 1,800 kg. per hectare for Robusta Coffee.

Brazil is one of the most important producers of coffee. The coffee concentration is along the slopes of the plateau of Sao Paulo. Coffee is also produced in Columbia, Ecuador, Venezuela and Guiana in South America. In Central America, the countries of Guatemala, El-Salvador, Costa Rica, and Mexico produce it. In the West Indies it is produced in Cuba, Haiti and Jamaica (Fig.16).

In Africa—Angola, Ivory Coast, Uganda, Ethiopia, Congo, Cameroon, Ruanda-Urundi and Malagasy produce coffee. In Asia—Indonesia, Sri Lanka and India are its chief producers. In India, the states of Tamil-Nadu, Kerala and Karnataka are the main producers of coffee (Fig. 16).

#### RUBBER

Rubber is a latex of the tree and is a kind of natural plastic with many qualities such as elasticity, resistance to water and non-conduction of electricity. It is thus a useful substance for waterproofing, insulating and for use where a strong but elastic substance is required, e g, in the making of pneumatic tyres.

Many plants produce latex capable of making rubber. At first rubber was produced simply by collecting latex from the forest trees that stood (among many other tree species) in equatorial rain forests, mainly the forests of the Amazon Basin. Those were the days, round the corner of the present century, when the town of Manaus on the Amazon River experienced an incredible rubber boom, and the river itself was an artery carrying one of the world's most desired commodities.

The Amazonian rubber boom was, however rather short-lived. Ways were sought to create rubber-tree plantations, where every tree and not just some among many, would produce rubber, where trees could be given attention and where collecting the rubber would be more efficient and easy. Seedlings of Brazilian rubber trees were planted in other parts of the tropical world, and in South-East Asia they did especially well. As a result, Malaya, the then Netherlands of the East Indies and its neighbouring countries became the leading producers and exporters of rubber in the world.

With the passage of time, more and more

uses of rubber were found and its demand grew continuously. The coming of automobiles was an enormous boost, and even today, most of the rubber produced is used up in vehicle tyres. Then the Second World War forcefully brought the need for alternative sources of rubber to the attention of the United States as Japan occupied much of South East Asia. This stimulated the production of synthetic rubber, and although plantation rubber came back to some extent after the war, synthetic rubber has been in the lead ever since. In 1970, world production of rubber totalled just under 8 million metric tons, 5 million of it synthetic, and less than 3 million natural (90 per cent of which came from South-East Asia).

One question that presents itself is this: Why were those rubber plantations placed in

South-East Asia and not in the Amazon Basin itself where the rubber trees were known to grow or in the Congo Basin, also an early source of wild natural rubber? The answer has less to do with trees than with people. In the South-East Asian countries a large supply of cheap labour was available, larger than in the Amazon or Congo and rubber tapping requires the constant attention of a large number of workers. Indeed, some rubber plantations were established in Africa, namely in Liberia, on a large scale by the Firestone Company. And lately efforts have been made to try the plantation system along the Amazon in the heart of Brazil.

Rubber is needed in enormous quantities where there are many millions of cars on the roads. The United States is the world's largest consumer of natural rubber and the

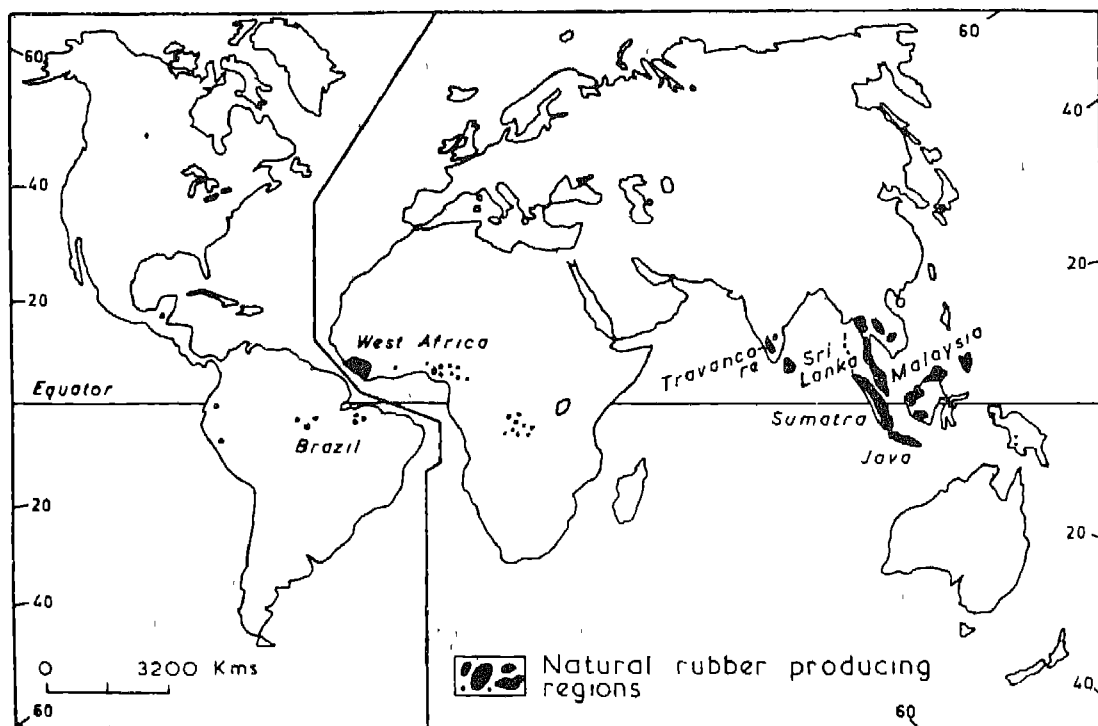


Fig. 17.

largest producer and consumer of synthetic rubber far ahead of Western Europe which comes second. Despite the spread of rubber planting to many tropical lands, South-East Asia has maintained the dominant position in rubber production which it gained in 1920. At present Malaysia, Indonesia, Thailand and Sri Lanka are the major producers (Fig. 17). The minor producers are India, Liberia, Comodia, Nigeria, Vietnam, Zaire and Brazil. In India some rubber is grown in the states of Kerala and Tamil Nadu where the relatively well-distributed rainfall is suitable for the crop (Fig. 17). India produces about 63,000 tons annually.

### Crop Combination

Crops are generally grown in combinations and it is rarely that a particular crop occupies a position of total isolation from other crops. The individual distribution maps of isolated crops are interesting and useful, but it is even more important to view the integrated assemblage of the various crops, grown in an area. For example, the demarcation of India into Rice Regions or Wheat Regions conceals completely the agriculturally significant fact that very often the Wheat Regions also have a rice crop or that wheat is often grown with pulses or sugarcane. For a better understanding of the agricultural mosaic of an area, a systematic study of crop combinations is essential.

Geographers have evolved and applied some useful techniques for the demarcation of crop combinations. The different methods of crop combination regions can be summed up under two headings: the arbitrary choice method (e.g., first crop only, first two crops or first three crops, etc.) and the crop combinations based on arbitrary choice method are, however, not rational and judicious as by applying arbitration the rest of

the crops are sadly excluded without any consideration of their percentage weightage in the total cropped area. The second method for the demarcation of crop combination regions is based on statistical techniques, which give a better objective grouping of crops of a region. These statistical techniques have been modified suitably by the geographers from time to time.

An important and more popular approach was advocated by Weaver for delineating the complex structure of agricultural regions of the Middle West in the United States. In his studies Weaver has taken into account the percentages of crop area to the total cropped area and has calculated deviation of real percentages for all the possible combinations in the component of real units against a theoretical standard. The theoretical standard is 100 per cent of the gross cropped area for monoculture, 50 per cent for two crop combinations and so on. The crop which has the least deviation from the theoretical curve is included in the combination. In India some valuable studies have been made for the delineation of crop-combination regions, training from micro to macro levels.

The study of crop-combination regions enables the agricultural land use planners to know the important crops, and their associations, grown in a region, which helps in the agricultural development and planning of the area.

### Agricultural Regions

The concept of region is of fundamental importance in geographical studies. A 'region' may be defined as a part of the Earth's surface having certain characteristics which enable it to be recognised as a unit, distinguishable from other units which surrounded it. A region may be defined in physical terms, e.g., a river valley, a plateau, in climatic terms, e.g.,

the equatorial and the Tundra region ; or by socio-economic criteria such as a textile manufacturing region or a jute, rice or wheat region.

An agricultural region is an extensive area of land with broadly similar conditions and patterns of agricultural practices, distinctive from those of the adjacent areas. In the world different agricultural systems are found each of which may be called a separate agricultural region. A crop, a crop association and a crop and livestock association may serve as suitable examples of agricultural regions : The Spring Wheat Belt of the United States and the Canadian Prairies provinces, and the association of wheat, alfalfa and cattle for the Wheat-Alfalfa-Cattle Agricultural Region of

Argentina Pampas. Two such agricultural regions long recognised in the United States are the Cotton Belt and Corn Belt. In India we can differentiate the wheat and rice belts in Punjab and West Bengal respectively. Similarly the North Western parts of the black soil of Maharashtra may be termed a Cotton Region of India.

The agricultural regions provide a total picture of the existing patterns of crops, their combinations and the problems associated with them. For an integrated agricultural development of an area it, therefore, appears to be almost essential to divide it into agricultural regions before any scheme of agricultural development is chalked out and implemented.

## EXERCISES

### Review Questions

1. What is meant by wet-paddy cultivation ? With the aid of a world map locate the major paddy growing areas.
2. On an outline map of the world show the major wheat areas and describe the geographical conditions necessary for its cultivation.
3. Select two contrasting areas where wheat is grown (a) for export and (b) for home consumption. Give reasons for their differences in production.
4. What are the major geographical factors that influence the large scale commercial cultivation of the following :  
  
(a) Tea and Coffee (b) Rubber and Cotton.
5. What do you know about the world production, consumption and trade of either tea or sugarcane ?
6. What are the main geographical requirements for rubber cultivation ?
7. Cotton textiles are now made mostly in cotton growing countries. Has this always been so ? Account for the historical shifts in textile manufacturing in any one continent.

8. Explain the terms crop-combinations and agricultural regions and give their economic significance.

### Find Out

1. Collect the seeds of the various important varieties of rice, wheat and cotton grown in your area.
2. Visit a sugarcane farm and differentiate between a newly sown and ratoon sugarcane crop.

### Cartographic Work

In the world outline maps show the following :

- (a) Rice growing areas ; (b) Wheat producing areas ; (c) Cotton growing areas ; (d) Tea, Coffee and Rubber producing areas.

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## CHAPTER VII

### Secondary Production

The conversion of raw material into fabricated articles on a large scale with the help of machines is called manufacturing. It is the second largest division of production after the primary occupations i.e., gathering, hunting, lumbering, fishing, mining, herding and farming. Manufacturing at present, varies from making simple articles e.g., rosewood oil, mustard oil, wax, to manufacturing with precision tools and complex machines such as aeroplanes, submarines and giant computers.

In the past, craftsmen were the chief manufacturers of goods for many centuries. As population grew and the demand for goods became larger and more diverse, craftsmen formed an increasing proportion of the communities in which they lived. They used to manufacture goods at their houses and therefore this type of manufacturing was known as a cottage industry. In India an appreciable proportion of the total textiles is still made by handloom weavers on a small scale in their houses.

A great change in the manufacturing industry occurred in the late eighteenth century with the Industrial Revolution in Europe. The invention of machines helped in large-scale manufacturing. Other important developments which gave added impetus to the

Industrial Revolution were the development of the steel industry and improvements in transportation. The first type of industry to be developed was that which transformed raw materials cotton, jute, wool, iron-ore into manufactured goods. These days more important industries are those which bring together partly manufactured items to make complicated equipment such as electrical appliances, automobiles, various machines, watches and luxury goods. Thus modern manufacturing involves the use of a variety of raw materials, an enormous amount of power, much capital, many skilled labourers and automatic electronic controls for the equipments. On the whole, large-scale industry is established with much time and effort. This is one of the reasons for the division of industry between countries that supply and those that buy manufactured goods.

#### INPUTS-OUTPUTS

Industries require, raw-materials, power, labour and capital to manufacture the required goods. Various factors employed by the producer in the industry are called inputs. Labour—skilled or unskilled, and capital (small or large amounts) are the common inputs required for the location and development of all sorts of industries, but the raw materials

used in each industry may vary. For example, some industries are based on raw-materials obtained from mines, while others may get raw materials from forests, farms or the sea. The nature and size of inputs, however, largely determine the scale of production and profit of the industry.

The commodities produced by an industry are known as its output. Every producer generally aims to produce that output which will yield him the maximum profit. No producer, therefore, likes to expand his output beyond the point where marginal revenue is equal to marginal cost, since to do so will increase his total cost by a greater amount than his total revenue. The quality, size and cost of the output of an industry depends on a number of physical and socio-economic factors e.g., availability of cheap raw materials and power, skilled and efficient labour, market and facilities of transportation. In the following paras the locational factors of industries have been described.

### **Locational Factors**

The location of manufacturing industries depends on a number of physical and socio-economic factors. For example, raw materials, power, labour, capital and market etc. are the determinants of industries. These factors may be called the basic factors in the development of modern manufacturing. The significance of each of them varies with time, from industry to industry, and from region to region, so that they cannot be listed in the order of importance. No single factor alone decides the location and growth of an industry. It is never an easy task to find an ideal site for the location of industries but it is possible to find the locations where the advantages outweigh the disadvantages.

### **Raw Material**

In most of the industries, production has

to take place where the resources are. The industries are usually located near mines, forests, farms and seas. The industries based on fish, timber and ores are generally localised where they are available. There are, however, certain industries which could be located in distant areas from the sources of production of their raw materials. For example, the cotton and the jute industries have been located in Britain on imported raw materials mainly from South Asia and Egypt, and the iron and steel industries of Japan are almost fully dependent on imported raw materials. Moreover, most of the iron and steel industries have been established in the coal belts of the world. In general the iron ores had to be brought to the coalfields which affect the manufacturing of a country or region. Decisions have to be made as to where to locate them. The weight and bulk of the raw materials have a lot to do with such decisions. It is better to refine an ore or to saw off useless waste from tree trunks practically at the site of production and then ship the raw materials for final processing into finished product, rather than ship them long distances first.

In the case of iron ore and coal, both needed in huge quantities to make steel, the alternatives are (1) to take the iron-ore to the coalfields, (2) to take the coal to the iron-ore deposits, or (3) to transport both to some intermediate location. Iron ore is usually transported to the coalfields, sometimes after the partial elimination of waste materials and impurities. There are exceptions to this rule. For example, coal is transported in huge quantities to the French Lorraine industrial region. Similarly coal is transported to the industrial complexes of Kanpur and Delhi from the coal mines of Raniganj and Jharia which lie at a long distance from these industrial cities. As a matter of fact, when an

industrial complex develops near the coalfield and the coal supplies become exhausted, it may be less expensive to start importing coal than it is to move the factories. Even when both coal and iron ore are transported over large distances to some intermediate location, the iron-ore usually travels the farthest. Most of the pulp-mills and saw-mills are located in the forest regions. The bulk of Canada's saw-mills and pulp-mills are situated in the coniferous forests, and those of Norway, Sweden and the U.S.S.R. have a similar location.

Foodstuffs such as fruits, vegetables and fish are sometimes bulky and perishable, so that they must be processed quickly and, therefore, they are processed near their areas of production. Canneries, dairy creameries, refrigerated plants, meat packing plants and sugar mills are the industries which are located within the area of their production.

#### *Power*

Manufactured goods cannot be made without the use of power. In the past men and animals were the major sources of power. The introduction of steam engines brought a radical change in the scale and varieties of manufactured goods. Moreover the development and expansion in the beginning of the present century, relieved the manufacturer of the necessity to locate the industry near the power site.

In most of the industries, especially the ferrous metallurgy, coal is the major source of power and, therefore, heavy industries are closely related to the coalfields. For example, the Iron and Steel Industry in the Damodar Valley in the towns of Tatanagar and Jamshedpur are located near the Raniganj and Jharia Coalfields. In the United Kingdom, the South Wales, Midlands, Lancashire and Newcastle industrial complexes are situated near the coal mines. Similarly the Appala-

chian-Great Lakes Industrial Region of the United States and the Donetz and Kuzbas Industrial Complexes of the U.S.S.R. are confined within the coal producing areas. Other resources of power e.g., electricity, petroleum, natural gas and atomic energy also help in the establishment of certain industries which do not require coke as the source of power.

#### *Labour*

Even during this period of computerised processing and automation, the available skills of a substantial labour force remains an important criterion in the location of manufacturing plants. Different industries require different types of labour. Some of them like watch-making, diamond cutting, electronics and aircraft manufacturing demand highly skilled craftsmen. Such highly skilled workers require specialised training and many live in certain localised areas. There are many industries which require semi-skilled people such as certain branches of textiles, electrical and chemical industries. But the bulk of the labour force in most industries is made up of unskilled labourers who do mechanical operations only and their work is generally mere repetition of the same operation, not requiring any special skill or training.

People of certain areas are well known for their skill in certain specialised branches of manufacturing. For example, the Swiss make fine watches, specialised textiles are made in Britain, cameras and electronic goods in Japan and book publishing is done in New York in the United States. It may not be skill but the cheapness of labour which may attract certain industries, e.g., the jute textiles and tea processing industries in India, Bangladesh and China.

#### *Market*

Market is another very important factor

influential factor in the localisation of an industry. A company is likely to establish itself in or near the largest city, where it has the biggest market, knowing that good communications radiate outward into the rest of the country and that distribution there will be very efficient. Industries that produce perishable goods (dairies, food processing etc.) will be located as near to their markets as they can. Some industries make products especially designed to be used by other industries, for instance, certain equipments of automobiles. It would not be sensible for a factory making speedometers for cars to position itself far away from the car manufacturing plant. When a commodity is very heavy and bulky, the proximity of the market is even more significant than when it is smaller and lighter. If the Swiss sell more watches in the United States and India than in Europe, it is unlikely that they will move their factories to the U.S.A. or to India. On the other hand, an American automobile manufacturer planning to sell a small car in the European market may decide to build the factory in Europe rather than to build the cars in the U.S.A.

There is a very strong justification for industries to be located near the markets which consume their finished products. But a dense population need not necessarily constitute a large market. For instance in many parts of Monsoon Asia the population does not have a high purchasing power and cannot afford to buy the goods that the industrialists turn out. Only industries which produce cheap and essential goods can find an adequate market in such areas. This partly explains why some underdeveloped countries, though densely populated, have very few industries.

#### Other factors

The above described are the major factors

of industrial location. They are interrelated and they do not operate independently. The location of one or several plants in a given area will influence others to locate there as well, so that a kind of clustering occurs. There is also a factor of political stability and receptiveness to investment. Industries are frightened away if there are signs of uncertainty in the political future of a region or country or if a government is planning to nationalise industries, owned by foreigners. The policy of taxation plays a role too, and some countries try to attract industries by offering huge tax exemptions over a long period. A few industries are located where they are because of environmental conditions, for example, the film industry has been strongly concentrated in Southern California, because of clear, cloudless skies. In India the localisation of the film industry at Bombay is mainly because of the favourable environmental conditions.

Market is a place where buyers and sellers are brought into contact with each other for the exchange of goods. It may vary from a temporary open weekly market to highly organised ones such as those like the cotton market at Surat and Bombay and the jute market at Calcutta. In a wider sense, however, a market can signify an area which, in fact may comprise the whole world.

The industries are likely to be located near markets. The foodstuffs industries are the most market-oriented and, therefore, factories of bread, cakes, pastries, cooked meats and vegetables are located near the market to ensure ready disposal of fresh products. Fragile goods are easily broken in transportation and therefore they are also located near the consumption areas. Industries using heavy and bulky raw materials are also established in the areas where their products are in great demand as transportation charges

increases the cost of production, making the commodity expensive and less competitive.

Although every country participates in the international market by selling or buying raw materials or manufactured goods those in four areas i.e., Western Europe, Anglo-America, South Asia and the U.S.S.R. exert great influence in the international market. The West-European, Anglo-American and the U.S.S.R. generally export finished products like machinery, engineering goods, electrical appliances, textiles and wheat to the under-developed and densely populated countries. The Asian and African countries on the other hand generally export raw-materials, ores, forest and farm products to the industrial and developed nations of the world. South-West Asia the major petroleum producing region of the world is an important market for food, machines, electrical and luxury goods.

### MAJOR INDUSTRIES

#### Iron and Steel Industry

Of all manufacturing, iron and steel is the most basic to our modern civilisation. Iron and steel are the foundations of modern machines, equipments and tools. Iron and steel are the chief materials in transportation and communication facilities in railways, highways, water and air, and in the construction of roads, tunnels, factories and pipelines.

In the long history of the iron and steel industry two main trends have been apparent, first of all the techniques of smelting, refining, forging and working of the iron have been greatly improved and increased in efficiency and secondly, in response to changing techniques, different locational factors have become important at different times. Since iron and steel supplies are vital to most of the industries, the change in location of iron

and steel industries have affected the entire industrial regions, causing them to decline or to prosper.

Before A.D. 1400 the only method of producing iron from ore was the direct process in which a large supply of wood was necessary as a fuel and it was essential to fell 0.4 hectare of forest to provide enough charcoal to smelt 5 tons of iron. In the sixteenth century, the use of coal and the development of the blast furnace allowed the industry to expand appreciably. As smelting with coal perfected, the iron produced by this method became more acceptable and, therefore, the iron and steel industry was more attracted towards the coal-fields. This shift saved the cost of transportation of coal which is consumed at the rate of two tons for one ton of iron ore. It was because of this fact that iron and steel industries were located in countries which have coking coal. Hence great producers of coal, like the U.S.A. and the U.K. are the major importers of iron ore, whilst Sweden, Spain, Algeria, and Cuba export their best ore. By the nineteenth century the techniques had greatly improved which again affected the location of the iron and steel industries.

The proportion of coke to iron in the blast furnace was greatly reduced. As a result, the coke-ore ratio has been reversed and only half as much coke is needed as iron ore. Thus coalfields, at present no longer exert the same pull on the iron and steel industry as they did in the past. The distributional pattern of the iron and steel industry is still in a state of transition. Today, besides other factors, markets for steel in the developed countries as well as the attraction of ore-fields and ports are leading to more dispersed patterns of this industry in the whole world.

The heavy iron and steel industry is concentrated in three large industrial regions

i.e., North-West Europe, North America and the Soviet Union (Fig 18). To these may be added isolated minor regions in India, China, Japan, South Africa, Australia, Columbia and Brazil. The absence of heavy industries in a country is explained by lack of fuel (coking coal), iron-ore and by poverty of means of transportation.

In Europe, the U.K., Germany, France, Italy, the Netherlands, Belgium and Luxemburg are the main producers of iron and steel. These countries have access to large iron-ore deposits of Sweden, Algeria, Spain and France and coking coal is obtained from the U.K., Poland and Germany. The transport of these heavy industries is helped by the development of inland waterways, canals, roads and railways.

The North American industry forms

another economic group of iron and steel industry. Its heavy industries are located away from the coast in the Great Lake Region. In this region, besides the supply of good quality iron-ore from the Mesabi range and coking coal from the Pennsylvania coal fields, the lake serves as a cheap source of transportation which has been interlinked by canals (Fig. 18).

The Soviet Union has two outstanding iron and steel manufacturing regions. The leading region is in the Ukraine based on the Donetz (Donbas) coal basin, the Krivoi Rog iron fields, and the Kech Peninsula iron fields. In addition to coal and iron-ore the region has one of the largest manganese deposits of the country. The second important iron and steel region lies on both sides of the Urals. Kuznetsk and Karaganda are the other impor-

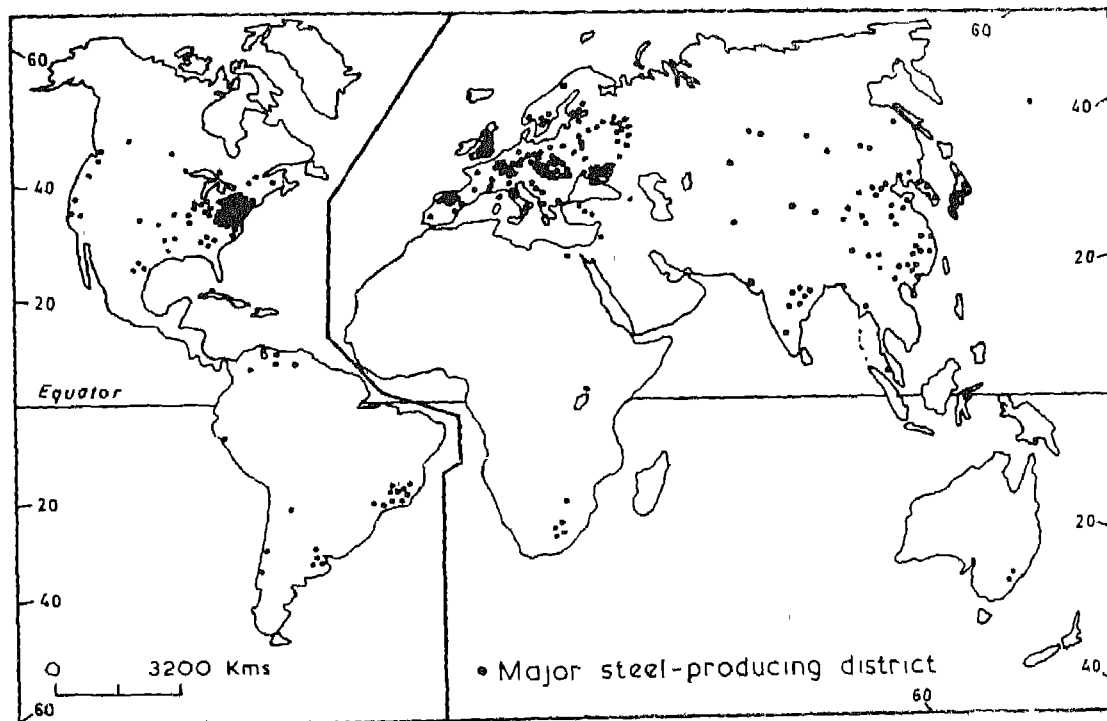


Fig. 18

tant iron and steel producing centres of the U.S.S.R. (Fig. 18)

The old steel production centres of China are Manchuria and Shanghai. Paotow in Inner Mongolia, Taiyuan to the Southwest of Peking and Wuhan on the Yangtze are the new centres of the iron industry. (Fig. 18). The Chinese iron and steel industry for iron-ore and coal is dependent on the Manchurian mines of ore and the Shansi and Shensi coalfields

Japan imports iron-ore from India, the Philippines, Malaysia, Australia and Brazil and scrap from all over the world for its iron and steel industry. It also imports coal from China and Korea. The important centre of manufacturing is Yuwata, known as the Pittsburgh of Japan. The other centres are Kobe, Osaka and Tokyo (Fig. 18)

India possesses abundant resources of iron-ore, coal and limestone. They are found very close to each other, giving a distinct advantage of location. The coal belt of Raniganj (West Bengal), Jharia, Giridih, Bokaro, Karanpur (South Bihar), Tata, Singrauli and Korba in M. P. and Talchar in Orissa. One of the largest deposits of iron-ore lies within the coal belt at Mayurbhanj, Keonjhar, Bonai (Orissa) and Singhbhum in Bihar. Owing to these favourable factors the heavy industry of India is located in this area at Asansol, Durgapur, Jamshedpur, Bhilai and Rourkela. In Karnataka, Bhadravati is the important iron and steel producing centre (Fig. 18)

### Chemical Industries

The Chemical industry became important only about a century ago, but it has expanded in influence to every sphere of modern life. Chemicals are required for smelting and refining metals, by farmers for fertilizers by the textile industries for dyes and in making pulp, paper, soap, glass, leather, explosives,

plastics, synthetic rubber and fibres. Owing to its many uses, chemical industry is growing at a faster rate

The raw materials of the chemical industries are many and are drawn from a variety of sources. They include mineral deposits such as salt, potash, nitrates, sulphur, coal, petroleum, natural gas, nitrogen, oxygen, hydrogen, vegetable oils, potatoes and by products of petroleum.

In the initial stages, the chemical industry established itself to produce cheap heavy chemicals, especially washing soda (sodium-carbonate) and sulphuric acid. Towards the end of the nineteenth century the industry began to produce organic chemical synthesis, especially material for dyes. From 1930 onwards the industry started to manufacture synthetic products that were in great demand, such as ammonia, synthetic amines, fibres and rubber, synthetic resins and plastics. Today the industry has reached the point of controlling the supply of raw materials. The rubber and cotton textile industries are largely dependent on synthetic fibres and rubber. Thus within a short time the chemical industry has taken the place of basic and leading industries in the world.

Some chemical industries depend largely on certain raw materials and so the site of factories are fixed where the raw materials are obtained. For example, industries based on by-products of coal are located on coalfields e.g., the Ruhr, the Saar, Pennsylvania and the Damodar Valley. Similarly industries using soda or chlorine are tied to deposits of rock salt. In contrast some chemical industries are independent of geographical environment. For example, some countries have been able to establish a chemical industry though they have none of the necessary raw-materials. Most countries producing super-phosphates have no natural phosphate deposits. For

instance Spain is the largest producer of pyrites, while the greatest makers of sulphuric acid (obtained from pyrites) in Europe are Germany, Great Britain and France

The chemical industry does not require highly skilled labourers, as the part played in it by machinery is highly developed. The delicacy of some operations requires strict control and this is entrusted to automatic regulation by instruments. The labourer's work is restricted to the handling of the crude products. Hence chemical industries recruit a good proportion of workers from among unskilled labourers. For example, in Modinagar and Modipuram, near Meerut (U.P.) the chemical industries employ peasants from nearby villages as seasonal labourers

Apart from raw materials, the chemical industry is especially developed in countries that have had long industrial experience, for they have the most highly developed techniques and the best scientists. Moreover, technical requirements are more important than geographical factors in the concentration of chemical industry, which demands reserves of capital able to bear enormous losses, or on the other hand, make large profits when a favourable opportunity occurs. For this reason it depends on a body of scientists, minute division of labour and a very strong trade organisation.

Chemical industries are all relatively young and must, therefore, often revise their processes. Recently artificial rayon has been partly replaced by nylon, which is itself being threatened by other synthetic fibres. Some plastics have had a very short life and products of a similar kind are continually ousting one another.

The chemical industry makes innumerable products but it is possible to group most of these under the following categories:

### *1. Heavy Chemicals*

Industries which depend on mineral deposits or on industrial by-products and concentrate mainly near sulphur or salt deposits, are known as the heavy chemical industries. Sulphuric, hydrochloric, nitric acids, caustics, soap, glass, paper and cement are examples of heavy industries.

### *2. Petrochemical Industries*

These are dependent mainly on the chemicals obtained from coal, natural gas and petroleum. Petrochemical industries are probably even more important than the heavy chemicals. Explosives, fertilizers, plastics, synthetic fibres and synthetic rubber fall in this category. Various types of household goods e.g., utensils, ornaments, containers, combs, floor-coverings, clothing, paints etc., are also included in this group of chemical industry. The main petro-chemical manufacturing countries are the United States, West Germany, United Kingdom, U.S.S.R., Japan, Canada and Australia.

### *3. Pharmaceuticals*

This branch of chemical industry manufactures drugs and medicines. At first these were derived from vegetable sources such as roots, bark, leaves or herbs, but now they are made from chemical compounds.

Many other products are also made with the help of chemicals. These are detergents, perfumes, cosmetics, lotions, toilet goods, oils of various kinds, dyes, varnishes, turpentine, insecticides, essences, etc. Their industries are distributed in the highly industrialised nations of the world.

### *4. The Textile Industry*

The term textile is derived from the Latin *texere* (to weave). Originally applied only to woven fabrics, it is now a general term for

fibres, yarn, jute and synthetic fibres. Textile manufacturing is one of the oldest and most widespread industries in the world. Despite the widespread mechanisation of textile and garment making, in many parts of the world, textiles are still made by hand-spinners and hand weavers. The invention of ginning and weaving machines have brought appreciable changes in the scale of production of textile goods. Modern mechanised textile industry was first developed in Britain. From Britain, the techniques of textile spinning, weaving, dyeing, printing and finishing spread to other parts of Europe, the United States, China, Japan, India and the rest of the world. Research and development in textiles have resulted in the emergence of new and improved fabrics, including synthetic fibres such as rayon, nylon, dacron and tetron.

For thousands of years the textile industry used cotton, wool, silk and linen according to the climatic conditions and availability of raw materials, but during the nineteenth century, after the introduction of textile machines, Europe and North America became the leading producers of textile goods. Britain with no local supplies of cotton and only a small proportion of its requirements of raw wool, became the leading textile manufacturer. This position, however, could not be maintained as the mechanisation spread to other parts of the world.

Textile industries are located mainly in relation to power and labour supplies. The lightness of transport of fibres means that the location of the raw material is not the important determining factor in the localisation of this industry. Coalfields in Britain and Germany, hydro-electric power supplies in North-Eastern U.S.A. and Japan are the important locational factors. Cheap labour supplies were important factors in the establishment of textiles in Southern U.S.A. and Japan. While in India,

Pakistan and China, the availability of cotton, cheap labour and large markets are the important factors which helped in the establishment of textile works. The use of synthetic fibres has led to the location of textile industries near the petrochemical and oil refining plants in some cases, but the ease in transport of synthetic fibres means, that this is a relatively unimportant factor.

The United States, the United Kingdom, countries of Europe, the U.S.S.R., China, India, Japan, Pakistan, Bangladesh and Brazil are the leading textile producers of the world.

In India, Bombay is the oldest centre of our modern cotton textile industry. The warm and moist climate of Bombay, an excellent port (for the import of machinery, coal and long-staple cotton), easy access to the cotton growing areas of Maharashtra and Gujarat, cheap and skilled labour from the neighbouring states and a vast local market resulted in a rapid expansion of the industry here. The development of hydro-electricity was a further help in the industry at Bombay.

Ahmedabad is another old centre of cotton textiles. This centre is situated in the heart of the cotton growing areas of India. With the development of the means of transportation and electricity the cotton mills are now widely distributed in the states of Maharashtra, Gujarat, Madhya Pradesh, Uttar Pradesh, West Bengal, Delhi and Madras. There are some mills in Punjab, Karnataka, Rajasthan, Orissa, Andhra Pradesh, Kerala and Pondicherry. Woollen textiles are produced in Dhariwal, Amritsar, Ludhiana and Bombay. Silk textiles are in Karnataka, West Bengal, Assam, Madhya Pradesh, Jammu and Kashmir and Bihar. Rayon is produced at Bombay, Ahmedabad, Surat, Calcutta, Gwalior, Amritsar and Modinagar while jute textiles are confined to the banks of the Hoogly river in the state of West Bengal.

### **Types of Manufacturing**

On the basis of the workers employed, the raw material used, the nature of goods produced and the degree of complexity of management the manufacturing industry can be classified into : (i) the cottage industry; (ii) the small-scale industry; and (iii) the large-scale industry.

#### *Cottage Industry*

Cottage industry is characterised by hand manufacture of local raw-materials at home. The work is done by the family and the consumption of the produce is done either within the family or sold in the local markets. Transportation and capital exert almost no influence on this type of industry.

The true cottage industry has disappeared from the developed countries of Europe and North America. In Asia, it is, however, still the most important manufacturing industry. The main articles produced in the cottage industry in Asia are foodstuffs, fabrics, clothing, mats, fish-nets, hats, boat-sails, containers of many sorts from cotton, silk, hemp, jute, wood, straw and palm leaves, tannin from forests, shoes, tools, porcelain and pottery, ropes, bricks, jewellery from silver, gold, jade, ivory and bronze. The main advantage of the cottage industry lies in the fact that much of this type of industry may be carried on during spare time from sowing and harvesting of crops. Thus cottage industry provides good opportunities for the employment of unemployed people and helps in making use of the spare time of the farmers.

#### *Small-scale Industry*

Small-scale industry is a natural growth of the cottage industry. Organisation of skilled craftsmen into groups gave birth to the small-scale industry, which in the early stages

used only hand power. It is now run by electric power. Small scale industry requires little capital and small machines. It draws raw materials from distant places and the manufactured goods are sold in distant markets.

In Europe the development of wind and water-power helped in the development and expansion of the small-scale industry, but the industrial revolution gradually replaced it by modern manufacturing methods. In most of the countries of Asia, especially in India and Japan the small-scale industry has been given adequate weightage and has been made an integral part of industrialisation programmes. At present a large number of skilled workers are engaged in this industry in the developing countries of Asia. Small-scale industry has made tremendous progress, especially after the Second World War. In Japan, nearly all small-scale industry is powered by electricity and is mechanised. Of the total number of manufacturing industries in Japan today, 56 per cent employ three workers or less and about 20 per cent 4 to 9 workers. It shows the importance of small-scale industry in the national economy of that country. The Japanese small-scale industry produces food products, textile products, lumber wood articles and toys, ceramics, metal products, electric goods, radios and precision instruments. Indonesia's small-scale industries manufacture ceramics, wood articles, furniture and metal products.

In India small-scale industry progressed at a faster rate, especially after independence. Foodstuffs, salt, spices, cigars, indigenous sugar known as gur, saw-logs, oil extraction, cutlery, shoes, leather goods, copper and brass-ware, perfumes, furniture, radios and textile goods are some of the important articles produced by small industries in India. Although modern textile mills have expanded remarkably, at least two-thirds of the weavers

in India operate handlooms. In the years to come the small-scale industry will go a long way in providing employment to masses in the thickly populated developing countries of the world.

### *Large-scale Manufacturing*

Manufacturing with the use of industrial machines is relatively new, having developed largely during the last 200 years. The large-scale industry involves the use of a variety of raw materials, enormous amounts of power, much capital, many skilled labourers, production of standardised products with interchangeable parts, mass production methods and complex management. This type of large scale production was first developed in the United States and the West European countries, but after the Second World War it has spread into many other manufacturing regions. India has established many large iron and steel industries, machine tools, chemicals, electric goods and textiles, in the private and public sectors.

### *Ownership of Industries*

To understand our industrial civilisation, we must understand the organisation and functioning of business enterprises. The business firms on the basis of organisation are generally classified into (i) sole proprietorship, (ii) cooperatives and (iii) corporations.

**Sole Proprietorship** : The sole proprietorship is the simplest form of business organisation. Establishing a sole proprietorship requires no legal documents, in effect a proprietorship exists from the moment a person decides to go into business alone. All the profits earned by a sole proprietorship accrue to the owner and so do all the debts incurred by the firm. Thus sole proprietorship has unlimited responsibility.

**Cooperative Proprietorship** : Any two or more people can get together and form a partnership, the contribution made by the individual partners and the share of profits they receive may vary as it depends on how they agree in the beginning to view the relative importance of each person's contribution to the partnership.

In any case, all the partnership's profits and losses accrue wholly and solely to the partners. Moreover, any partner regardless of how recently he has joined a partnership or how small his role in it is liable without limit for the debts of the partnership. Large business is organised and run by cooperative proprietorship.

### *Corporation*

A corporation is a group of persons associated together for some particular purpose. In a corporation, a certain number of shares of common stock (alternative name for Ordinary Shares) are issued. The numbers of shares issued may be large or small. Each share represents part ownership in the corporation. All of the corporation's profits accrue to its shareholders which may be distributed among them. The shareholder, however, is not responsible for its unpaid debts. Thus if a corporation goes bankrupt, the maximum loss any shareholder will incur is the amount he paid for his share, and therefore, the corporate shareholder has a limited responsibility. A very large business, involving complex management is run by a corporation.

### *The Public Sector*

The wealth and property which are owned collectively by the community as a whole are called social wealth or public enterprise. These include all property owned by the state or local authorities, all public buildings, schools, libraries and assets of the nationalised

industries. Rourkela and Bhilai Iron and Steel Industries are examples of public sector enterprises in India

### *Multinationals*

When a firm, industry or enterprise is established in collaboration with other countries, it is known as a multinational enterprise. The foreign country for such industries provides capital and technical know-how, while raw materials, labour and market are available from the country in which the industry is being set up. In India a number of multinational industries have been located with the help of the U.S.A., the Soviet Union, Germany, France and Britain and similarly India is establishing many multinational works in the developing countries of the Middle-East and Africa. Coca-cola is an example of a multinational enterprise. In India, however, its production has been stopped

### *Industrial Complex*

Owing to locational factors industries tend to cluster in certain areas favourable for their development. It is not always possible to discern just why a certain assemblage of industries has developed in some regions. We may understand that raw materials are brought in at low cost, but there may be other factors involved that are not so clear or obvious. History has to do with it sometimes. Plants were transferred from one kind of power to another but they stayed where they were, and then the clustering process took place. Perhaps national planning was the deciding factor in the Soviet Union where some industries were built to produce goods that could have been bought more cheaply than they could be made at home. In the 1930's the U.S.S.R. located plants far East due to a potential threat from Germany so that they could continue to function even in the

case of war and invasion.

Whatever the underlying causes, (and they are many and complex), a small number of industrial regions exist today whose factories produce a large proportion of the entire world's industrial output. Some of the important industrial complexes are given below.

### **The European Industrial Complex**

The European industrial region consists of areas stretching from the British Midlands in the West to Silesia in the East. The midland industrial complex specialises in textiles, steel, metal-plates, automobiles, motorcycles, aeroplanes, hosiery and leather goods. Scotland's Edinburgh-Glasgow and South Wales are the other important industrial regions of Britain which manufacture a great variety of products e.g., iron and steel, products based on coal, ships, food processing and tanning industries. In London, owing to a great domestic and international market, steel, machines, textiles, chemicals and agro-based industries are greatly concentrated (Fig. 19).

In spite of the coal shortage, Paris has been the leading marketing centre of France and Europe and, therefore, around this city a number of industries of luxury goods have been established. In Paris jewellery, perfumes, toilet and fashion goods, automobiles, metal industries, manufacturing and assembly, chemical goods and printing and paper goods are manufactured.

Around the coalfields of France, Belgium and Germany to Southern Poland, Ruhr, Saxony and Silesia is another important complex of Europe (Fig. 19). Besides coal, this region has the advantage of various minerals, easy accessibility and large markets of high purchasing power. The Ruhr complex manufactures steel, railroad equipments, automobiles, vehicles, machinery, textiles and chemicals with an almost endless variety of

associated products. In the Saxony complex, printing, publishing, ceramics and textiles are major products, while Silesia produces machine and diverse chemical goods.

Other noteworthy concentrations of industry exist in Eastern Sweden around Stockholm (noted for paper, wood products, textiles, ships, precision instruments), Northeast Spain, Lyon (France) and the North Italian district.

#### North American Industrial Complex

The North American industrial complex,

manufacturing assorted goods has no rival in the world. Sustained by a wide range of natural resources and developed transport system, North American manufacturing developed rapidly and successfully. Ample capital, mass production, specialisation and diversification mark the growth of this region.

The bulk of American manufacturing is concentrated in the North-Eastern part of the country covering the areas from Montreal to

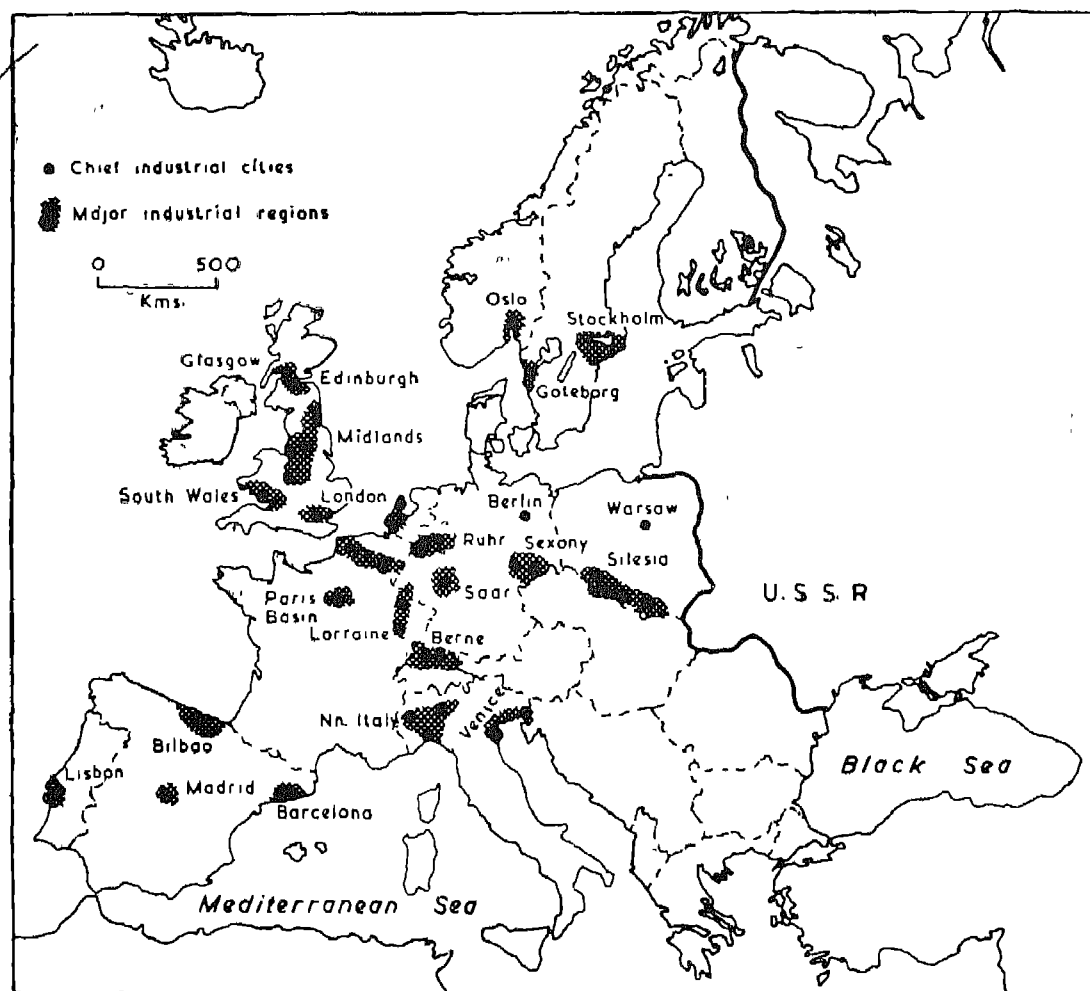


Fig. 19

St Louis and from New England in the East to Minneapolis in the West (Fig. 20) The New England complex manufactures, hardware, kitchen goods, and textiles. New York has a good reputation in printing, publishing, light machinery, tools, textiles, metal goods, various kind of petroleum products and food-processing. The Pennsylvania industrial complex has steel mills, chemical industries, textile factories and light-machinery plant.

On the other side of Lake Erie, the Montreal-Ottawa industrial complex, along St. Lawrence river has the advantage of cheap hydro-electricity and, therefore, it has specialised in aluminium products, sugar refineries, textiles, electric goods

Pittsburgh, Cleveland, Chicago and Detroit have industrial complexes of iron and steel, bulldozers, harvesters, military goods,

(armoured cars, tanks, radar, guns), computers, refrigerators, record-players, toys, corn-flakes and food products In the South, Birmingham, Atlanta, Dallas and Houston are the major industrial complexes which manufacture goods like steel products, petrochemicals, textiles and meat packing, In Western U S A , in the state of California at the cities of San Francisco, Seattle and Los Angeles are the industries of wines, beers, food processing, citrus fruits packing, fertilizers and films

### Soviet Industrial Complex

The Soviet manufacturing districts are widely dispersed. The major industrial concentrations of the Soviet Union are around Moscow, the Ukraine, the Volga and the Urals. All the four lie in European Russia (Fig 21).

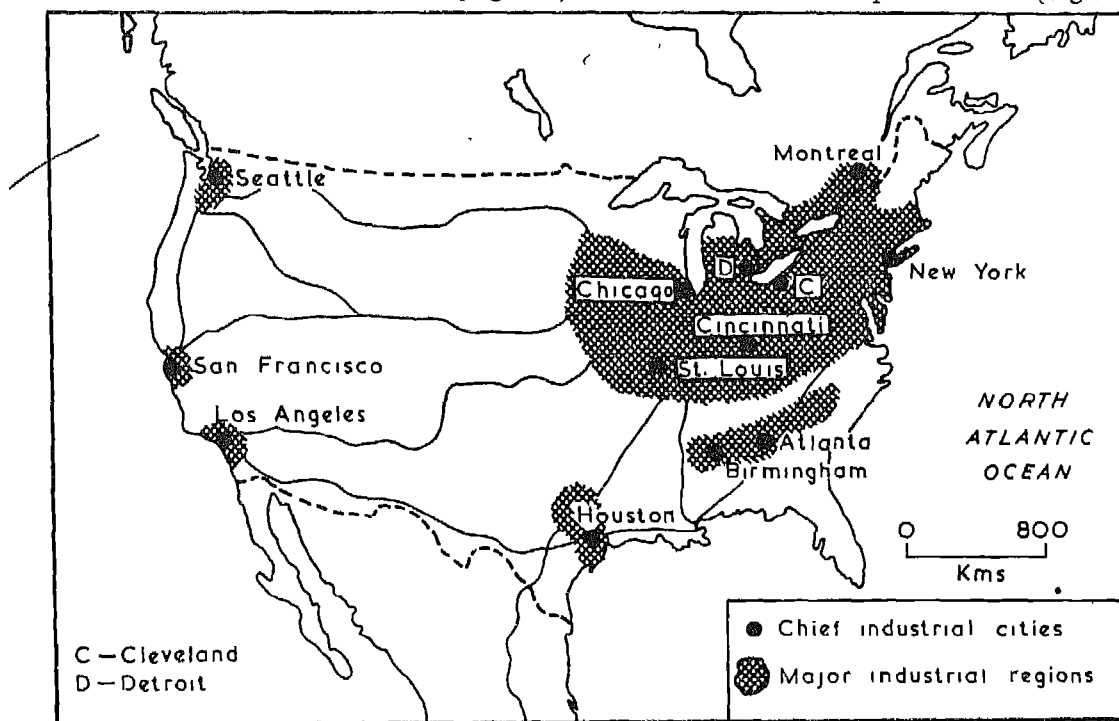


Fig. 20

The Moscow region, often called the Central Industrial Region, is the Soviet Union's oldest industrial district. The Moscow Region is not well endowed with natural resources but it is well connected with the neighbouring raw material providing areas by roads, railways and inland waterways. The major industries of this complex are cotton, woollen, flax and synthetic textiles, metallurgy, petiochemicals, machines, paper, pulp, printing, furniture and food processing. Moscow, Gorky, Ivanovo, Yaroslavl, Nогinsk, Kovrov, Kolomna and Tula are the major industrial towns (Fig. 21)

Ukraine has rich deposits of coal at

Donetz, iron ore at Krivoy Rog and manganese in the Crimean Peninsula. These basic requirements of industries have enabled the Donbas area of Ukraine to grow as one of the leading industrial districts of the Soviet Union. The major industries concentrated in Ukraine are iron and steel, metallurgy, heavy and agricultural machinery, electrical goods, chemicals, sugar factories, aeroplanes and precision and surgical instruments. The other important industrial complexes of the U.S.S.R. are the two elongated areas of the Volga and the Urals. The Volga complex was developed after the Second World War as the Moscow and Ukraine industrial areas were threatened

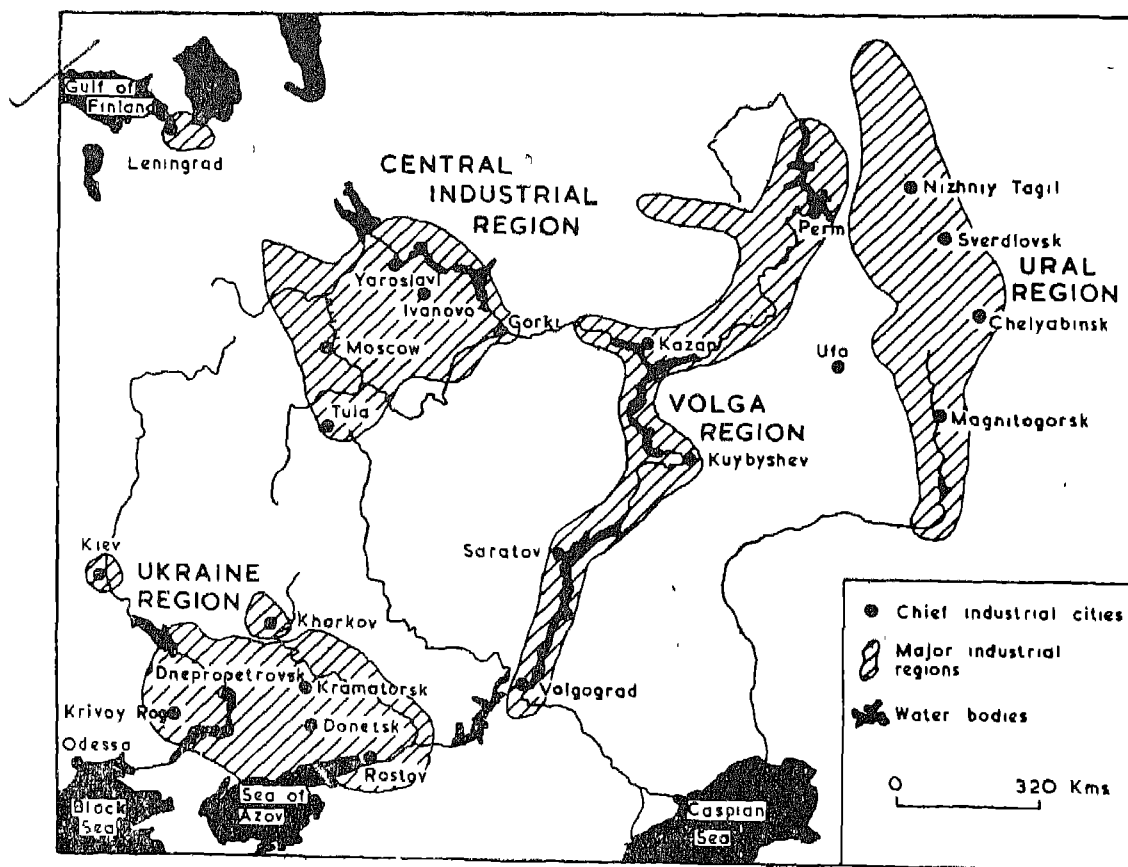


Fig. 21

by the German armies. Similarly the Ural region was developed rapidly during the Second World War. The Urals have an enormous variety of metallic ores including iron, copper, nickel and chromite. Coal is brought from Karaganda and Kuzbas. The major industries concentrated in the Volga and the Urals are iron and steel, metal goods, heavy machinery, chemicals, agricultural equipments, textiles and petrochemicals.

### Japan

The major concentration of industries in Japan is found in northern Shikoku, Kyushu, South-Eastern Honshu in the cities of Tokyo, Nagoya, Osaka, Hiroshima, Niigata and Nagasaki. Steel products, petroleum, ships, machinery, aeroplanes, automobiles, cotton, and silk, woollen and other textiles, toys, watches, luxury goods are manufactured in these complexes of Japan.

### China

China's industrial growth started rather late and there are only a few small pockets where assorted industries are emerging. Shenyang (Mugden), Peking, Tientsin, Shanghai, Nanking, Wuhan and Canton (Fig. 22) are however the major industrial concentrations of China.

In Australia, Sydney, Melbourne, Brisbane, Adelaide, Canberra and Perth have specialised in dairy products, wool, meat packing, dyeing and food stuffs. In South America, substantial industrial development is taking place in a few areas. The Rio de Janeiro-Sao Paulo district of Brazil has specialised in heavy industries. Other complexes are coming up in Argentina, Uruguay and central Chile. Transvaal, Cape Town, Durban are the main

industrial centres of Africa.

In India the chief industrial belt lies in South East Bihar and West Bengal. This area is well endowed with natural resources like coal, iron ore, manganese, limestone and other materials required for the establishment of diverse industries. Jamshedpur and Durgapur are the important iron and steel, automobile and machinery producing centres of the region.

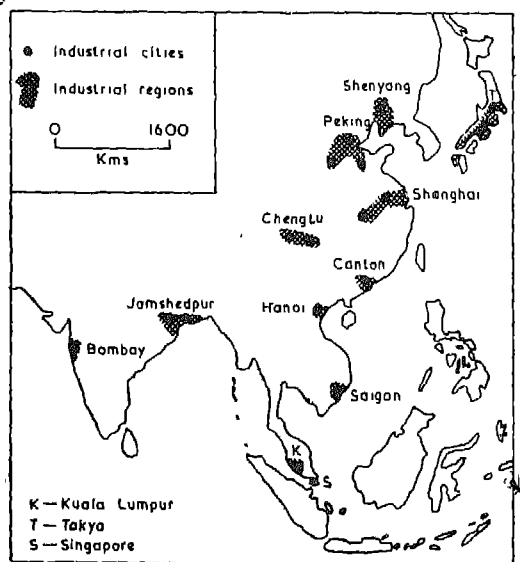


Fig. 22

In addition to iron and steel in Jamshedpur, India has a major cotton manufacturing industry, centred at Bombay and Ahmedabad, and has, in Calcutta a major centre of diversified manufacturing. Calcutta has a railway assembly plant, food processing, jute and cotton textiles, chemicals and printing industries. Madras, Hyderabad, Kanpur and Meerut are also growing at a faster speed as the important industrial districts of India.

## E X E R C I S E S

### Review Questions

1. What do you understand by manufacturing ? How does it differ from hunting, fishing, mining, lumbering, herding and farming ?
2. Explain the locational factors of industries with the help of suitable examples.
3. By referring to relevant examples, explain why industries of a similar kind tend to concentrate in the same area
4. 'The world's major iron and steel areas have a coastal location.' To what extent is this true ?
5. The Jute industry is mainly located in West Bengal and Bangladesh. Why ? Discuss
6. Distinguish between
  - (i) Inputs-Outputs.
  - (ii) Staple fibre and synthetic fibre.
  - (iii) Chemicals and petrochemicals.
  - (iv) Private and cooperative ownership
  - (v) Private and Public Sector.
  - (vi) National and multinational industries.
  - (vii) Agro-industries and heavy industries.
7. The following are some of the major industrial complexes of the world.
  - (i) The Midlands Industrial complex,
  - (ii) The Greater London Industrial complex,
  - (iii) The Central Industrial Region (Moscow),
  - (iv) The Tokyo Industrial Region,
  - (v) The North-east Industrial complex of the United States,
  - (vi) The Bihar-Bengal industrial complex.

Relate the industrial growth of these areas to the availability of raw materials, power resources and markets.
8. What factors control the location and development of the following industries :
  - (i) Iron and Steel industry,
  - (ii) Textile industry in India,
  - (iii) Chemical industry in the U.S.A.
  - (iv) Lightmachine industry in Japan.
  - (v) Heavy industry in the U.S.S.R.

### Finding out

- (i) Visit an industrial complex in your neighbourhood and find out the various locational factors responsible for the development of the complex.
- (ii) Visit a colony of the industrial workers and note down their mode of life and their main problems.

- (iii) Visit a chemical industry and find out the role played by machines and manual labour in the industry.

### Cartographic Work

In the outline map of the world show ·

- (i) Industrial complex of Britain and Europe,
- (ii) Industrial complex of the U.S A
- (iii) Industrial complex of the U.S.S.R
- (iv) Industrial complex of China and Japan,
- (v) Industrial complex of India

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## CHAPTER VIII

# Tertiary Production

Tertiary industries include services such as transportation and communication, financial services (like banking), retailing, recreation, and government. The transport complex consists of paths, roads, highways, railways, waterways, airways and pipelines. Moreover, telephone and telegraph services, radio and television are also effective means of communication. In fact, tertiary industries are not the producers of commodities but their efficiency and effectiveness play a vital role in the enlargement and development of Primary and Secondary occupations of man.

### TRANSPORT AND COMMUNICATION

Transport and communications constitute the infrastructure for the growth and development of agriculture and industry, and as such determine the stage of progress and culture of the people living under different environmental conditions. As a matter of fact, the economic activity and the development of transport facilities go hand in hand. The complex system of specialised production and exchange (where each region, at least to a limited extent, produces the things for which it is best suited) relies on transportation. The working population, both employed in the government and personal services, largely depends on the means of transportation. Thus the expansion,

development, and integration of various means of transportation and communication is very significant in our daily lives.

### Roadways

Paths, cart-tracks and roads have been utilised by men from prehistoric times. These routes were originally established according to the distribution of continents and their relief. There are 'natural routes' through which, before any intervention by man, the relief of land determined convenient traffic lines along which trade ultimately passed. The passes, cols, valleys and plains were used by early man for transportation, and the primitive men of the Congo, the Amazon and South-East Asia still follow the paths and tracks through convenient passes and valleys. With progress in culture and civilisation, these natural routes were developed and maintained by man in good condition to speed up transport and communication. A road, in fact, is the result of man's work and an unfailing indication of a highly advanced stage of civilisation. The expansion and improvements of roads by man enabled a market to be made for agricultural produce and helped relatively uniform prices over a wider radius. In India, the areas having inadequate roads show great variations in prices of all commo-

dities including essential goods. Moreover, the construction of roads has made the rise of industrial life possible

Roads are important routes of both passengers and freight transport. A road is most economical over relatively short distances and has the advantage of delivering goods directly to destinations avoiding loading and unloading as in the case of railway and inland waterways. Roads have been made most extensive by man, and goods carried over them can be delivered from door to door.

In general, the distributional pattern of roadways resembles that of railways. The road network has, however, a far greater density in most areas than that of railways. Moreover, roads cover a large area, many of them extending into regions with relatively few railways or waterways. The most developed road systems are in the United States, Southern Canada, Western Europe, Japan, Southern Australia, South Africa and Argentina. These are the technically advanced areas with a variety of modes of transportation, having dense population and a variety of economic activity. India too has a good road system.

In old and underdeveloped countries, roads have been and are being improved to meet new needs. In Asia, there are many roads which run across many countries. In America motorways run for long distances e.g., there now exists a great transcontinental road, the Pan-American, 37500 kms long, leading from Alaska to Southern Chile. In the Old World, if international conditions allow a road could be constructed connecting Europe with Siberia, India and China.

In India more than half the metalled roads are in the South, where the availability of traps, granite and other hard rocks facilitate road-building. The major highways in India connect the important cities of Bombay, Calcutta, Madras, and Delhi with one another.

Its national highways provide links with Pakistan in the North-West, Tibet in the North and Burma in the East. The density of roads is, however, still very low and needs expansion for the amalgamation and integration of the various cultures found in India.

On the whole roads along with rail systems, reflect human communities, degree of civilisation and level of technological development for they make traffic possible in places where nature seems to have piled up obstacles and where primitive man would never have tried to pass.

### Railways

Railways present a new stage in the history of civilisation. They have revolutionised geographical conditions in the various parts of the earth and have brought to man the benefits of the conquest of time and space. The first railway line was laid in North-East England to transport coal from the mines of the Newcastle region. From 1835 onwards short distance railways were built in Europe and in the United States. Railways have appreciably helped in solving the problems of road and canal traffic. Moreover, in the present century, electrification has speeded up the efficiency of railways. Perishable goods like fruits and vegetables, previously transported by canals and roads are now sent by railways. Railways have enabled the establishment of direct relations across great distances, owing to the adoption by most countries of standard rail-gauge. They help in industrial development and in securing the political stability of a nation.

The significant patterns of railway lines of the world have been plotted in Figs 23 and 24. A study of railway patterns reveals three distinct designs of railway network in the world: (i) The intensive network; (ii) the trans-continental, and (iii) the intragressive

pattern (i) In the Northern Hemisphere, the two regions with the most intensive railway network are Europe, especially Western Europe, and the Eastern United States. The evolution of these networks went hand in hand with the industrialisation of those regions. The Soviet Union is expanding its railways in Siberia under a deliberate policy for the national integration of the distant Eastern Soviet frontiers into the State's framework.

(ii) Secondly there are trans-continental railway lines. These railway lines connect distant lands that differ in economic activities and consolidate vast territories by linking centres of population facing two opposite coasts on a single continent. The Trans-Siberian and the Trans-Canadian Railways are examples of trans-continental railways

(Fig. 23).

(iii) Intragressive railways are those in which the railroad originates in the interior and moves towards the coast. This pattern of railways is found in the sparsely populated parts of the world e.g., the tropical wet forests, hot deserts and cold regions. The best example of intragressive railways is found in the continent of Africa (Fig. 24). Many of its railway lines commence in the interior and run to the coast without any inter-connection. This reflects the socio-economic situation of the continent which has been an exporter of raw materials, hauled from the interior to the seaports and shipped to the major manufacturing regions of the developed world. South Africa which is most developed industrially, however, is the exception.

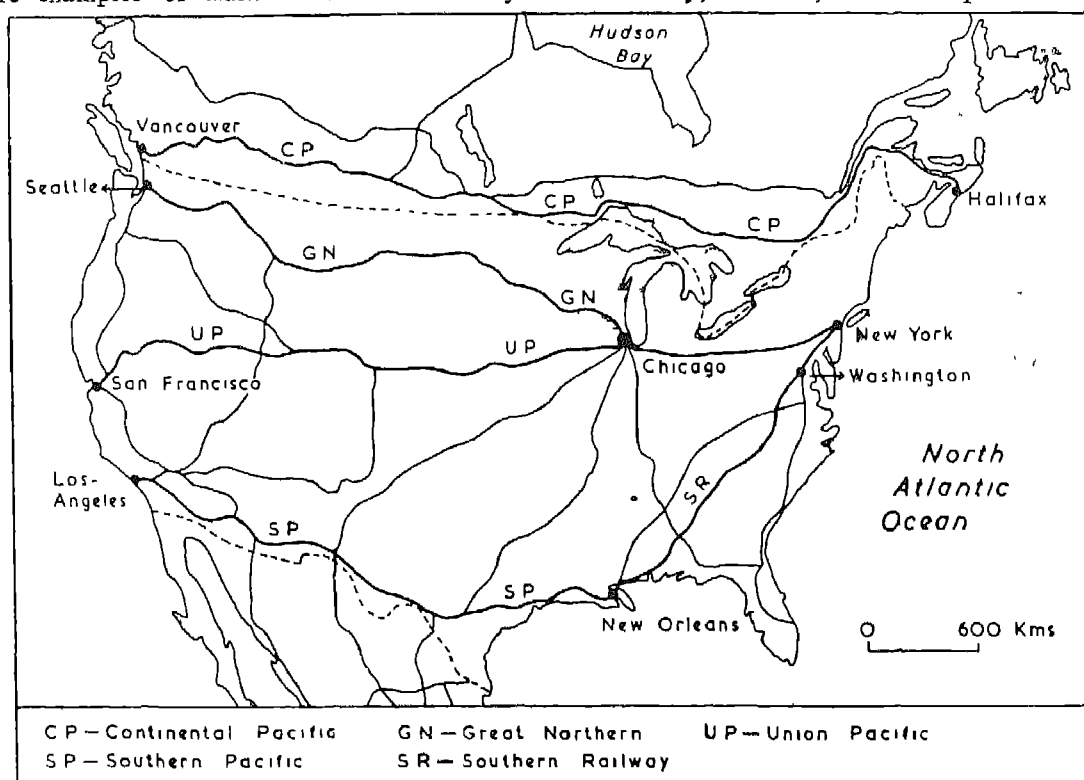


Fig. 23

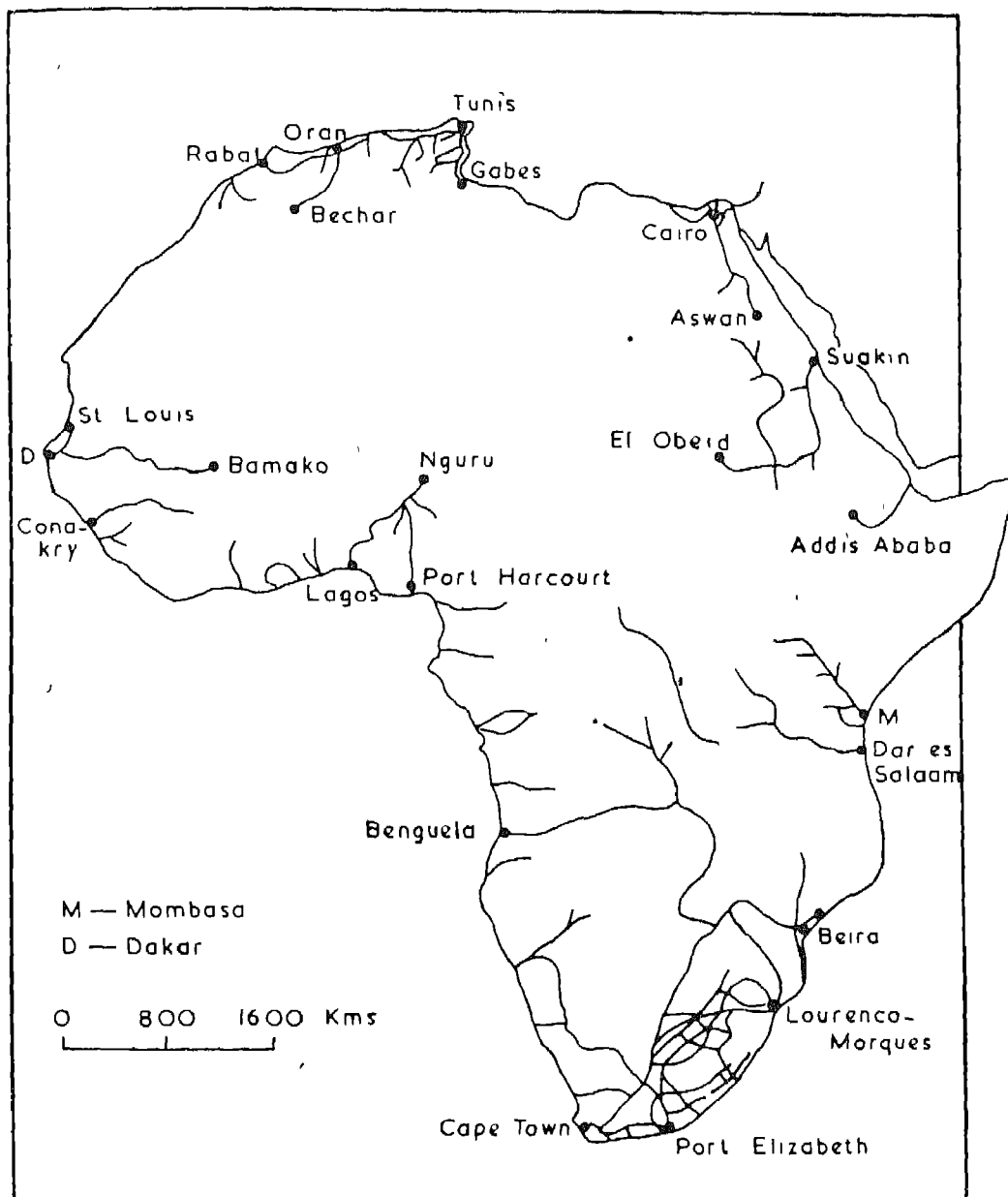


Fig 24

In Australia the railways are still in the initial stages of development. There is only one line extending from the North to the South (in Eastern Australia), and East to West

(in Southern Australia) In South America Argentina is the only country which has a developed pattern of clustered railways, especially in the central part of the country.

In India the first railway line was constructed in 1854, between Bombay and Thana. Since then there has been great expansion of railways in this country. The total length of our railways is about 656,000 kilometres. Indian railways are the principal means of our national transport, handling about four-fifths of the goods and seven-tenths of the passenger traffic. The Indian railways are owned and run by the Union Government. The electrification of railways is under progress to increase their efficiency and to cope with the rising demands of the rapid industrialisation of the country. Our railways are, however, still the most crowded railways in the world.

### Sea and Inland and Waterways

Since the earliest times water transport (rivers, lakes, sea, and canals) has been used for carrying men and goods. Even today, at a certain level of civilisation the waterways is a profitable means of transport, for they enable heavy goods to be carried easily. Up to the nineteenth century some waterways were mainstreams of traffic. A number of market towns were developed owing to waterways e.g., London, Paris, Calcutta, and Allahabad. At present, when roads and railways are the most used forms of transport, inland waterways retain an economic function of the highest importance, both in the agricultural and industrial regions. They are the cheapest for bulky goods and the waterways need no special tracks except in the case of the canals.

The value of waterways depends far less on the number of streams running through a country than on the physical conditions of

the main rivers, the availability of water in the channel throughout the year and the general situation of the river-mouth. It is because of this fact that most of the rivers flowing near the tropics, like, the Niger, the Darling, the Godavari and the Krishna, are on long sections of their courses navigable only during the rainy season. Moreover, the river course must be free from rapids, gorges, cataracts, and waterfalls. Owing to these geographical features navigation is not possible in big and perennial rivers like the Congo, the Nile, the Zambezi and the Kaveri. It is an advantage for the river to have easy contact with the sea, as happens in broad estuaries up which the tides can rise into the river valleys as in the case of the rivers of North-Western Europe.

The navigable rivers of the world are confined to the equatorial, monsoon, North West European and Tundra climates. In the equatorial and monsoon regions man has done little more than profit from the natural advantages of the rivers and has used them without making special improvements. In the tropical underdeveloped and developing countries efforts have, however, been made by man to master the main rivers. In them, sections of railways have usually been built to bypass stretches with rapids and to connect the navigable reaches. On the Congo, for example, there is a section of railways joining Mafadi and Leopoldville and on the Nile, Halfa is connected with Abu-Hamed.

In cool temperate lands in the northern hemisphere, on the other hand, inland waterways have been improved by man from early times. Efforts were made to coordinate the naturally navigable parts and to improve the difficult ones. In Europe, many commodities like cereals and mineral ores travelled by water in the sixteenth, seventeenth and eighteenth centuries. Waterways were used even

to carry passengers. Today, when the means of rapid transport have greatly increased, waterways no longer carry passengers and perishable goods.

A number of countries in Europe e.g., France, Germany, Belgium, the Netherlands, and the USSR have very extensive inland waterways including both rivers and canals. They are highly competitive with rails and roads in the transportation of freight. In the North America, the important waterway is the Great-Lakes St Lawrence waterway, shared by Canada and the United States. The Mississippi and its tributaries constitute the other important inland waterway of the United States.

The Amazon, the Yantze-Kiang, the Nile, the Indus, the Brahmaputra and the Ganges are the other important rivers used for navigation. In India less than a hundred years ago the river carried much freight and the Ganga was navigable from Calcutta to Hardwar (situated at the foothills of Siwaliks). Today they handle only a small fraction of the former freight because of railways and road competition and the diversion of water into canals for irrigation, especially from the Ganges.

Ocean transport presents the cheapest means of haulage across water-barriers that separate product from consumer miles apart. The oceans offer a free highway, with no maintenance costs as in roads, railways, and canals. The importance of sea transport was increased when wind-power was harnessed by the use of sail. The Egyptians, the Greeks, and the Romans had wide trading contacts, and the Arabs and the Indians traded throughout the Indian Ocean and South-East Asia. The invention of the steam engine revolutionised sailing and greatly reduced the influence of weather conditions. Now newer forms of power-engines, especially nuclear power, have

been applied to shipping which have increased the efficiency of sea-routes and helped in the growth and integration of various cultures and civilisations

#### OCEAN TRANSPORT

With the great advance in technology, ocean-going ships are capable of carrying far larger loads than railways, road transport, or aircraft. By increasing the size of ocean carriers, large volumes of world trade can be handled at very low costs. The introduction of refrigerated chambers for transporting perishable goods such as meat, fruits, vegetables and dairy products, and the development of tankers have greatly improved the efficiency of ocean transport. Modern liners and cargo ships that are driven by powerful engines, and equipped with radar, wireless and other navigational aids are little hindered by wind or weather and can cross the ocean at moderate speeds and reach their destinations on schedule. The major ocean trade-routes are shown in Fig 25.

1. *The North Atlantic Route* : On both sides of the North Atlantic are located regions of very dense population and varied industrial activities. Some of the world's largest terminals are located in Rotterdam, Antwerp, London, Glasgow, Liverpool, Hamburg, Stockholm and Oslo. Large quantities of manufactured items, textiles, chemicals, machinery, steel, fertilizers, wine are exported from these ports across the North Atlantic to the United States and Canada.

Along the eastern coast of North America are the important cities e.g., New York, Boston, Philadelphia, Baltimore, Montreal, Quebec and Toronto. These cities export to Europe foodstuffs, raw materials, wheat, animal feeds, cotton, tobacco, paper, wood pulp, timber, nickel, and copper. The foreign trade of the North Atlantic ocean is greater than

the rest of the world combined.

2 *The Cape of Good Hope Route* · This route connects Europe with the countries of South-East Asia and the Far East. Through this route, raw materials such as rubber, jute, sugar, tea, coffee, and tin from South-East Asia are transported to Europe. The closure of the Suez Canal after the Arab-Israeli War 1967 gave great significance to the Cape of Good Hope route.

The Mediterranean, the Suez and the Panama Canal are the other important sea routes which are described below.

*The Suez Canal* : The Suez Canal, opened in 1869 (Fig. 26), is one of the great achievements of man in the field of transportation and navigation. It linked Europe with South Asia, South-East Asia and the Far East, and thus provided a short-cut sea-route between the European and Asian countries. Once, this canal was considered the 'Life Line of Great Britain,' because oil supplied from the Middle East and tropical raw materials

and foodstuffs from the Asian countries went through the Suez. Manufactured products went by way of the Suez to Bombay, Karachi, Colombo, Singapore, Hongkong and Australian ports. Other European countries also made heavy use of this short-cut to their Afro-Asian markets. As a result of the 1967 Arab-Israeli War, the Suez Canal was closed to all traffic and its strategic importance as a major world trade route came to an abrupt end. The United Arab Republic suffered great loss of revenue, but the far-reaching effects on the trade of Britain, West Germany, France and Japan were felt. During the closure of the canal vessels were switched to the long route of Cape of Good Hope. As a result of closure of the canal the importance of oilfields in Libya and Algeria was also greatly increased because they are closer to Europe. Again after the opening of the Suez Canal in 1974 the situation eased. The canal thus plays a vital role in the transportation of goods from the developed European

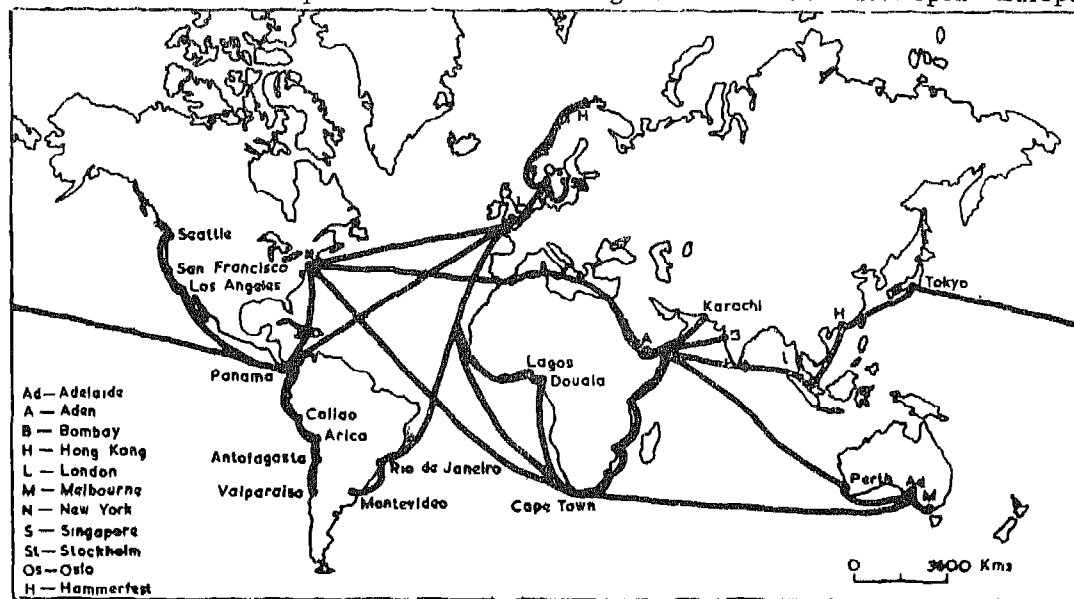


Fig. 25

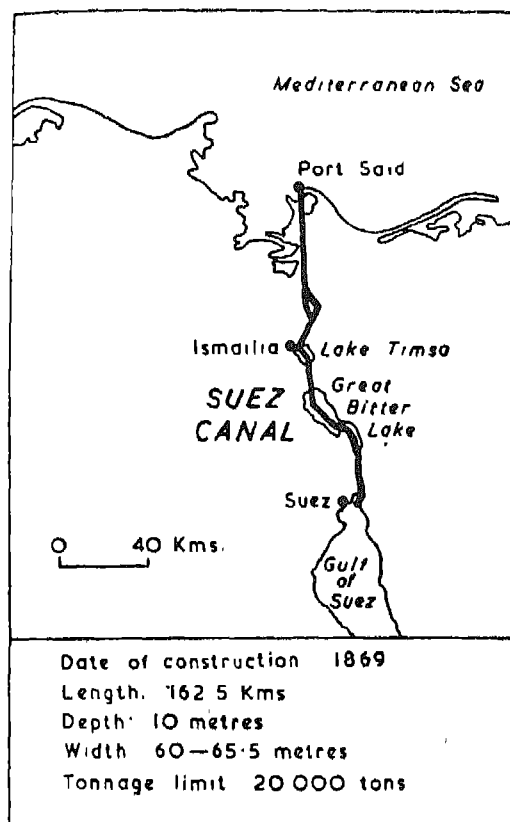


Fig. 26

countries to the developing countries of Asia.

**The Panama Canal :** This canal, lying between the continents of North and South America, connects the two great oceans—the Pacific in the South and Atlantic in the North. It was constructed, owned and controlled by the United States. The route, which came into use in 1914 with the completion of the Panama Canal, eliminated the long and hazardous voyage round the stormy Cape Horn. It is the 'Gateway to the Pacific' which has benefited countries on both Atlantic and Pacific seacoasts, facilitating trade of raw materials and manufactured products. The construction of the Panama has saved more than 4000 kilometres from Auckland to

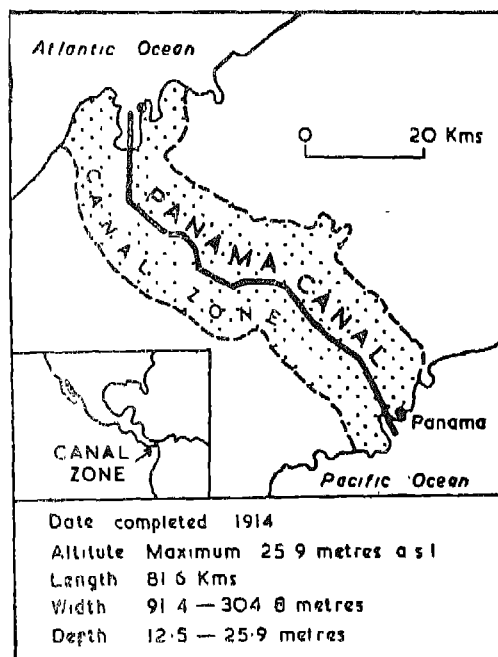


Fig. 27

New York via the Panama canal, instead of Cape Horn, (Fig. 27).

#### AIR-TRANSPORT

Man's conquest of the atmosphere has been achieved by the use of craft. It has been rapidly developed in the last 50 years and is constantly becoming more important, but development has been uneven in different parts of the world. Air transport is, however, relatively independent of physical barriers such as mountains, deserts, seas and oceans. It is relatively expensive and therefore air-freight traffic has been much slower. It is used for cargo either when speed is essential, as in the case of perishable goods, urgently required medical or food supplies or high value luxury goods. One specialised role played by aircraft is in the relief of major disaster when land transport would be unable to reach. In the case of wars, earth-

quakes, floods, and so on, medical supplies, food, and rescue personnel, can be quickly airlifted to affected areas

With the advent of jet propulsion, flying time is now considerably reduced. The major cities of the world are connected by air routes which have helped in the amalgamation of various cultures, existing in the various parts of the world.

The development of air transport into-

petroleum, gasoline, fuel-oil, natural gas and water in many parts of the world. Pipelines in most of the large petroleum fields move crude petroleum to local coastal or distant markets. The United States is foremost in pipeline transportation and has pipeline mileage nearly equal to the mileage of railway-lines. Many of the Middle East oilfields are also connected by pipelines to the ports on the Mediterranean (Fig. 29). In the Middle

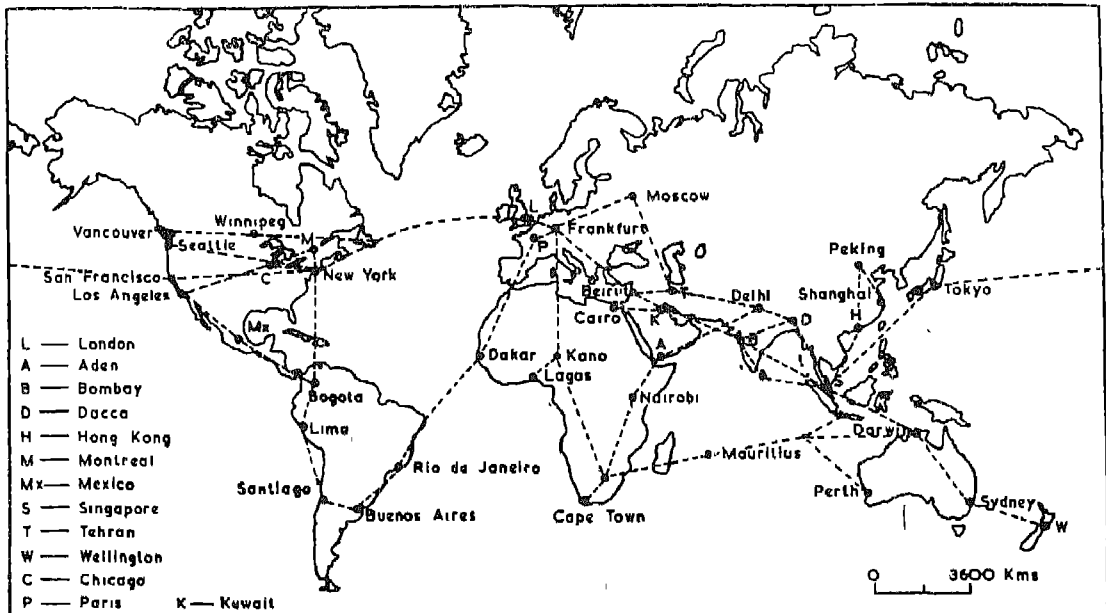


Fig. 28

duces defence problems in times of peace, for disease and insect pests which were not serious problems in former days now travel by air, and so rapidly that they threaten to take us unaware. The net result of air navigation, however, is beneficial, for any conquest of distance is to man's advantage, quite apart from the fact that new employment is afforded to workers. The important air routes of the world have been shown in Fig. 28.

#### PIPELINES

The pipeline is a new means of transport mostly used for the transportation of crude

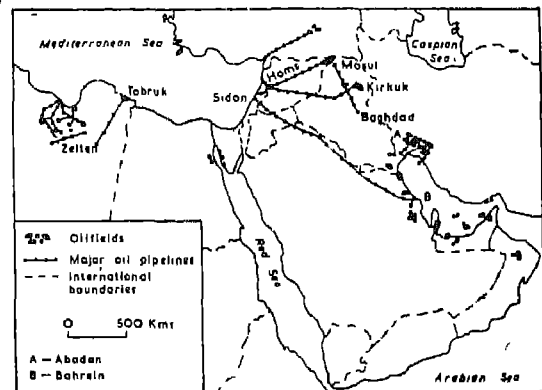


Fig. 29

East pipelines cross the desert from Iraq to Tripoli and from Ras Tanuia (Arabia) to Sidon (Trans-Arabian Peninsula pipeline). India has also laid pipelines from the Assam oilfields to move crude oil to the Baruni refineries in Bihar and Nunmati refineries near Gauhati in Assam.

#### MODERN MEANS OF COMMUNICATION: A SHRINKING WORLD

Each new development in transportation and communication has brought distant lands closer, lessened isolation and increased the interdependence of the world's populations. For long, transportation was by land only, both slow and painful. The movement of goods was then difficult and expensive. Later on man learned to navigate the oceans effectively, which soon increased his knowledge of the inhabited world and permitted trade in the products of distant areas, many previously unknown. At the same time, methods of moving goods by land improved with the building of railways and the construction of highways.

A major significance of the present system of transportation is the fact that it enables areas to specialise in production and to exchange their products for other goods in which other areas specialise. This geographical division of labour permits large-scale production and sale of crops, minerals, lumber and manufactured products at much lower costs than would be possible if every family or every physical or biological region tried to be self-sufficient. By bringing together the diverse rural and urban landscapes the transport system makes a whole nation, and to considerable extent the whole world, a single market.

#### Trade

Like transport and communication, trade

is one of the important tertiary activities of man. It ranks next to farming and manufacturing in employment and is far ahead of hunting, fishing, lumbering, mining and transportation. On international trade, to a considerable degree depends the economic status of a nation. Moreover, the volume of international trade is often taken as an economic indicator or a guide to the country's economic standards.

Trade is simply the exchange of commodities and this can take place at any level. The earliest form of trade was probably barter in which goods were exchanged for goods without the use of money. The barter system is still carried on in some primitive societies and shows the underdeveloped stage of the economy of such societies. In the interior parts of rural India vegetables and fruits are still often purchased through the barter system. It has three drawbacks (i) it is dependent on two people being mutually able to satisfy one another's wants; (ii) a rate of exchange has to be determined before a transaction can take place; (iii) the exchange of large for small commodities is difficult. Owing to these difficulties trade is mostly done through the medium of currency.

In our daily lives the most popular form of trade is retail trade in which shopkeepers sell goods to individual customers for money. On a large scale it is the wholesale trade which is carried out within a country and by which factories or importers sell their goods to wholesalers who in turn sell them to shopkeepers. The extent of internal trade of a country largely depends on the variety of regions within a country, its geographical spread, the purchasing power of its people and the size of its population.

*International Trade:* The exchange of goods, services, raw materials, capital and gold across national boundaries is known as inter-

national trade. In the complex economic activity patterns of today, no country can be completely self-sufficient and trade between countries is therefore essential to ensure the supply of a country's needs. Moreover, some countries may produce a surplus of certain goods and if these are not to be wasted they must be sold outside the country. The increasing trend of industrialisation has made international trade increasingly important. Industrial nations (like Britain, and Japan) require raw materials for their factories. Much of this has to be imported from countries that are mainly agricultural where there are surpluses to spare. Similarly these agricultural countries need machinery to run their farms, and manufactured goods for their homes. These are supplied by the industrial nations.

The basis for international trade is thus the existence of surplus and deficits. Consequently trade develops between areas with unlike types of production. The people of higher latitudes draw upon the tropics for those commodities they cannot produce or which they cannot produce to advantage; those of the tropics, upon intermediate (temperate) latitudes for the products of the cooler parts of the earth. Trade is thus governed by the extent of natural resources, size of population, the stage of economic development, extent of foreign investment, transport and government policies.

Trade is also affected by the culture of populations, for these affect both wants and the possibility of satisfying them. Underdeveloped population, generally, export raw materials and import manufactured goods. Industrialised areas import food and export manufactures. These conditions influence the general nature of the present trade between developed and developing countries. For example, in view of this fact, Britain (a developed country) produces more machinery to be

exported to India which is developing rapidly. However, such trade must be temporary only, for differences in culture disappear, and eventually the developing country becomes a competitor in the sale of manufactured goods. This has already occurred in Japan. Only about three decades ago Japan was an importer of factory equipments, now the Japanese flood the international market, including those of Europe and the United States, with fabricated products, made at such low costs that even the developed countries find it difficult to compete.

International trade may be of two types i.e., (i) bilateral and (ii) multilateral. Bilateral trade is the exchange of commodities between two countries whereby, for instance, one country provides raw materials and the other returns manufactured goods. In the multilateral trade, exchange of goods takes place between a number of countries without any direct exchange of goods between any two of them. Multilateral trade occurs when countries are perfectly free to trade with one another, thus enabling an international division of labour to be carried out to the fullest extent. India has a well developed multilateral trade and has a trend of favourable balance of trade, mainly owing to the industrial and agricultural advancement in the country.

*Foreign Exchange* : The system whereby one currency is exchanged for (or converted into) another is called foreign exchange. The fact that each country has its own monetary system is one of the principal complications of international trade. In order to facilitate international trade one currency is exchanged for another. If a commodity is purchased within the country, the price can be paid in the customer's own currency, but if an Indian wants to purchase an English car directly, then he must pay in British money

(pound sterling) rather than in Indian currency (rupee). Exports and imports of goods between nations with different units of money introduce a new factor—the foreign exchange rate, giving the price of the foreigner's unit of money in terms of our own. For example, at present, the exchange rate of the Indian rupee to the British currency is £1=Rs 16.00p. It, however, fluctuates with the change in the purchasing powers of the currencies.

**Balance of Trade.** The difference between the value of a nation's exports and imports of goods and services over a given period of time is known as balance of trade. This is a relationship between a country's payments for import of goods and its receipt from the export of goods. An excess of exports has traditionally been termed a favourable balance. An unfavourable trade balance, however, is not necessarily an indication of economic difficulty, as an excess of import may be more than offset by income from foreign investments, like banking and other services.

**Major ports as Gateways.** A port is a point where ships can tie up or anchor, and so load and unload commodities. This implies the existence of an adjacent settlement, hand-

ling facilities, docks and a system of inland communication. A port is, therefore, essentially a gateway to the land from the sea, and also, nonetheless truly, a gateway to the sea from the land.

Ports grow and prosper because they are important gateways of trade. Trade is attracted when a port enjoys economic advantages like (i) a large productive and consuming hinterland (ii) easy access to the hinterland and (iii) location on or near the main world trade routes. The fundamental importance of a port, however, consists in the extent and productiveness of its hinterland. A hinterland means a region to which a port acts as a 'door'. The trading operations of the port of Calcutta are performed for West Bengal and Bihar, and, therefore the hinterland of Calcutta includes these states. The resources of a hinterland should be bountiful, if the port is to develop into an international port. A dense population, rich economic products and a good transport system make a hinterland productive. Some of the important ports serving as gateways are London, New York, Rotterdam, Singapore, Hong Kong, Bombay, Calcutta and Sydney.

## EXERCISES

### Review Questions

1. Transport and communications are the necessary infrastructures for the economic advancement of a country. Explain.
2. Describe the role played by roads, railways and inland waterways in the development of industrial complexes. Give suitable examples to illustrate your answer.
3. Outline the difficulties of road and rail construction in Africa.
4. With the aid of a sketch map, mark the major sea routes across the North Atlantic Ocean and the North Pacific Ocean and name the major sea ports along these sea routes.

5. Write a note on the Canadian, Pacific and the Trans-Siberian Railways showing their importance in the cultural integration of Canada and Russia.
6. Describe the cultural importance of the Panama and the Suez Canals.
7. The transport networks of many developing countries reflect their concentration on exports of primary products. Discuss this statement.
8. Describe the importance of industrial complexes in the world and explain the role of man in their development.
9. "The expansion of the means of transport and communication, is shrinking the world." Discuss.
10. Differentiate between
  - (A) (i) Inland waterways and roadways.
  - (ii) Barter and monetary trade.
  - (iii) National and International trade
  - (iv) Port and harbour.
  - (B) Write short notes on
    - (i) Foreign exchange.
    - (ii) Balance of trade

### Practical Work

1. Find out the major tertiary industries of your locality.
2. Visit a village and try to find out if the barter system is prevailing in the village
3. Collect the currencies of the countries you can get easily and name the currencies of ten important countries.

### Cartographic Work

1. (i) Draw a world map and show two areas where railways are most complex.
- (ii) Mark the Trans-Siberian and the Trans-Canadian railways with important stations.
2. Plot the important sea routes on the world map.
3. Prepare the map of the world showing important air routes.
4. Draw sketches of the Suez and the Panama Canals.

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# Population and Settlements

### Distribution and Density

Human geography is concerned with man and his use of natural resources. Distribution, density, regional variations in growth rates, demographic structure, age-sex composition, etc. are some of the important aspects of population

The most striking features of the distribution of population on the earth's surface is its uneven and haphazard nature, and its concentration in areas North of the equator. The distribution of population of the world has been plotted in Fig. 30. This figure tells us the existence of regions that are underpopulated or overpopulated, and others that are virtually uninhabited. The underpopulated areas have one or two persons to the square kilometer and cover more than 950 million sq. km. which is 75 per cent of the earth's surface ; whilst areas with more than 100 persons to the kilometre cover only 2.5 million sq. km

### Sparsely Populated Regions

The arid expanses, the polar caps, lofty mountains, and dense forests are the sparsely populated areas of the world. The deserts form the greatest blank spaces in the distribution of population, for without water there can be no vegetation

and, consequently, no food for man or beast. Two great series of deserts occur in the trade-wind belt in each hemisphere, but the area of these regions in the Northern Hemisphere is greater than that of those in the South. Oases are moderately populated so here the population is limited by the amount of water available, which dictates how much land may be irrigated. In mid-latitude deserts, such as the Gobi desert, cold as well as drought is a problem. Though many desert areas have rich mineral resources, settlements associated with these are usually small and will cease to exist when the minerals are exhausted. Food and other necessities, especially water, must be brought in even at great cost.

The second region which has proved difficult for man's existence is the zone of extremely cold climatic conditions. In the regions near the poles or in high mountains, temperatures remain low all the year and winters are especially severe. Snow and ice may be permanent or may thaw for a few months only. The growing season is so short that agriculture is not possible. Fish are numerous but difficult to catch in the ice-covered seas and hunting is restricted because not many are suited to the harsh conditions. Thus few men can survive, for a large population would exhaust the available wildlife.

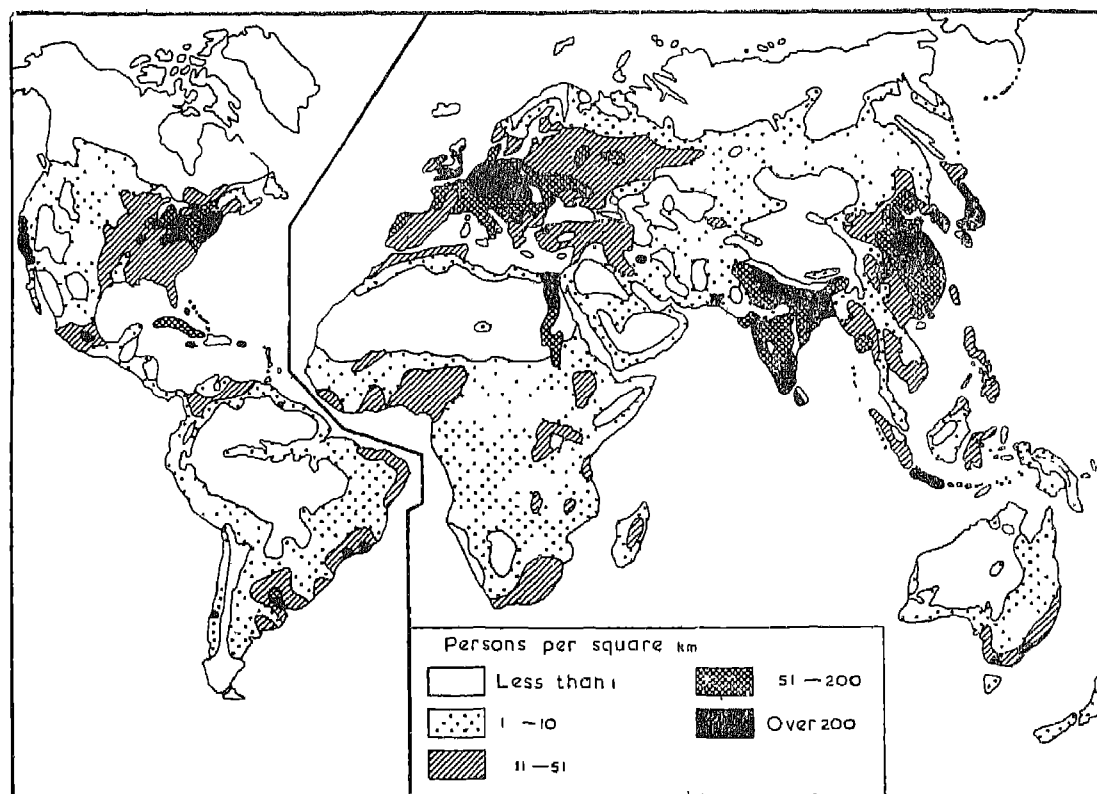


Fig. 30

Scientists, miners and other specialists often live temporarily in these regions, but they bring in their food, clothing, building materials and equipment from outside. Iron ore is the true cause of settlement at Gällivare in Sweden, gold has founded the Dawson city in the Yukon valley in Canada and Fairbanks and Fort-Yukon in Alaska. In Soviet Siberia gold, oil, coal, salt and rare metals have spread a series of towns along the Arctic coast. Maintaining of this type of settlement on a large scale is, however, very difficult and therefore, Tundra regions are never likely to be densely populated.

The population on mountains becomes sparser with altitude. In mountainous areas, the difficulties of cold weather and lack of soil

are aggravated by lack of sufficient gently sloping land for farming and settlement. The thinness of the atmosphere at an altitude above 4000 metres makes breathing difficult. Only plateaus where farming and communications are relatively easy have people settled down and elsewhere settlement is usually concentrated in valleys. Owing to the physiological obstacles population in the mountainous parts of the world is likely to remain sparse.

In the equatorial belt, especially the equatorial lowlands such as the Amazon Basin, parts of the Congo Basin, and parts of South-East Asia, temperature, rainfall and humidity remain high throughout the year. Although there is abundant wildlife, the thick evergreen equatorial forests impede travel and make

hunting difficult. Thus these are thinly populated parts of the world.

### Densely Populated Regions

Fig. 30 reveals that in some regions man has prospered. The densely populated parts of the world are Monsoon Asia (India, China, Bangladesh), North-West Europe, Japan, the North-Eastern parts of the United States and adjacent parts of Canada. All these are situated in the Northern Hemisphere. The abundance of moisture and the richness of life in monsoon lands where two to three paddy crops are harvested in a year, is the background of a vast concentration of people. In India, China, Egypt and Java the economy is basically agrarian. In these areas 1000 to 2000 people live on a square kilometer. This is only possible because climate, relief, soil and water supply in these regions are favourable and help in the cultivation of cereals and in plantation.

The densely populated areas of Europe are dependent on industry. The food for these large centres of population is not only produced locally but also imported from all over the world. So they are much more dependent on industry, trade and commerce. The Industrial Revolution and the rise of largescale manufacturing enabled working people to collect in masses around factories. This gave birth to big industrial cities and led to great population concentration. The concentration of people in North America is smaller and much newer and adjusts itself to nature in the same way as that of Europe. It is in fact an extension of the latter.

India is essentially rural, having an agrarian economy. Cultivation of crops is largely dependent on the monsoon rains, and almost all food comes from the soil. The distribution of high density of population in India corresponds to the heavy rainfall that helps

in raising two to three cereal crops in a year. The following table shows the relation between rainfall and the density of population.

TABLE III

<i>Place</i>	<i>Mean Annual Rainfall in inches.</i>	<i>Density of popu- lation per sq. kilometre</i>
Gangetic	78	220
Eastern-Ghat	47	196
The Deccan Plateau	29	60
The dry west.	11	26

With a mean density of about 120 persons to a square kilometre the population of India is extremely uneven in its distribution. The Ganga valley is the most densely populated part of the country. It contains about 60 per cent of the population of the whole country owing to there being 200 persons to the square kilometre in parts where three crops are grown in the year; between 100 and 250 in parts where two crops are raised in a year; between 40 and 100 in black cotton country and less than 40 persons per sq. km. in the mountains and the Thar desert of India. The district around Delhi contains more than 400 persons to the sq. km.

### Population Growth

Estimates of world population in the early history of mankind must necessarily be guesses. But at the beginning of the food producing revolution, when settled agricultural communities began to replace bands of hunters and gatherers, perhaps about 6000 B.C., world population was unlikely to be less than one million or more than five million. The advances in agriculture laid the basis of the river valley civilisations and heralded great increase in numbers, possibly as much as 250 million by the beginning of the Christian Era.

At present the total population of the

world is over 3,500 million. In 1850 it was about 1,098 million. So the growth in the last 125 years or so has been greater than any in the entire previous history of mankind. The population is likely to be doubled by the end of the twentieth century (Fig 31) If esti-

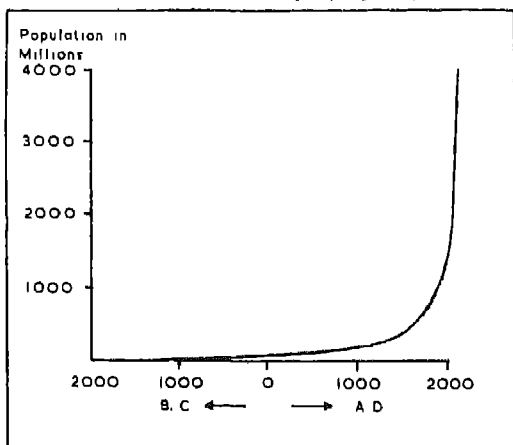


Fig. 31

mates of the past are to be regarded as having any value, population seems to have been increasing steadily for many hundred years as the following table shows :

TABLE IV

Year	Million	Year	Million
1650	465	1900	1,550
1750	660	1950	2,370
1800	830	1960	2,972
1850	1,098	1970	3,960

The above table shows that, whilst world population has greatly increased, the rate of increase quickened by about 1900, and between 1900 and 1960 it has almost been doubled.

#### *Population growth in India*

The first serious attempt to count the population of India was made in 1872. The population of that year was over 203 millions, not including Burma. In 1881 it was 236 million, an increase of about 33 millions in

the population of 1872. In 1921 it grew to 306 million. Since 1921, India's population has, however, grown at a considerably fast rate in comparison to the growth of population in Europe and other parts of the world. The increase being from 306 millions in 1921 to 389 millions in 1941, a growth of over 27 per cent in 20 years gives an average annual rate of 1.2 per cent. The most significant feature of India's population growth during the past 70 years is its great variability. It grew at a low rate of about 1.5 per cent or less in the first two of these seven decades, and only since 1921 has it shown a consistently high rate of growth—about 11 per cent in the decade 1921-31 and 15 per cent from 1931-41.

The reasons for these great fluctuations in the population growth of India are to be found in the slight control over the death rate, and in the fact that Indians live close to the subsistence level. In 1943-44 a famine in Bengal, is said to have killed as many as two or three million, possibly even more. Though the estimation of the future growth of population differs between various demographers, they indicate a very marked increase. It has been estimated that by 1980 the population of the world will be at least 4,000 million, and by A.D. 2,000 it will be between 6,000 million and 7,000 million.

#### **Demographic Structure**

Population is made up of men, women, children, working people and the old people who are often dependant on others. In different societies the proportions in these classes vary, and this affects the life of all the members of the society.

The simple sex ratios are not of great significance because they rarely depart from equality. In England and Wales rather more boys than girls are born, but this ratio

TABLE V

Country	Population statistics for selected countries				
	Total population in thousands	Average density per sq. km	Birth rate per thousand	Death rate per thousand	Mean annual % increase
Australia	13,132	2	20	9	1.9
Belgium	9,757	320	15	13	0.8
Brazil	101,433	12	42	11	3.0
Canada	22,125	2	18	7	1.9
W. Germany	61,967	249	20	12	1.0
India	574,216	175	42	23	2.4
Japan	108,346	291	19	7	1.0
Netherlands	13,438	329	19	8	1.3
U.K.	55,933	229	17	12	0.6
U.S.A.	210,404	21	17	10	1.3
U.S.S.R.	249,747	11	17	8	1.2

Source : UNO Statistical Year Book-1974

*Definitions of some population terms :*

Birth rate— Number of live births per 1,000 of the population.

Death rate— Number of deaths per 1,000 of the population.

Infant mortality rate—Number of deaths of children below one year of age per 1,000 of the population

Life expectancy : The average age at which people die. It is important to realise, however, that it is not the age at which most people die, e.g. in India the figure is 50 years of age, whereas in Britain it is 72, this is because more young children die in India and thus bring down the average expectancy.

Natural Increase . . Excess of births over deaths per 1,000 of population. This does not include increase in population due to immigration

changes gradually as the percentage of women increases, in the older age groups. This is usually shown by an age-sex pyramid. An age-sex pyramid shows the frequency distribution of the population of a specific area in which males and females are recorded as bars in each five-year age group from 0 to 80+. The base represents the youngest group, the apex the oldest. The horizontal bars are drawn proportional in length either to the percentages or to the actual numbers in each group. But pyramids of numbers of persons are impossible to compare, so the more usual pyramid shows the percentage of

males in each group on one side and the percentage of females on the other. This simple diagram enables us to see at a glance, what proportion of the population lies in each group, and the shape of the pyramid immediately suggests the type of society portrayed. In Figs 32-33 age and sex structures for India and U.K. have been plotted. Fig. 32 shows the age-sex pyramid for India. It can be seen here that the pyramid has a broad base and a rapid tapering at the narrow peak. This pyramid is typical of many agrarian countries in which there is a large number of children and in

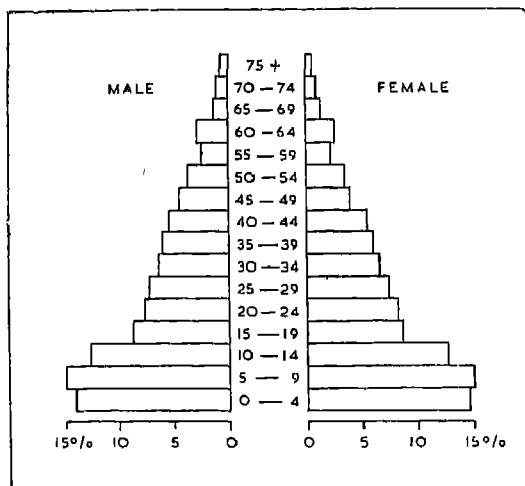


Fig. 32

which the comparatively high death rate among older persons as well as children tapers off in the older groups.

In great contrast to this is the pyramid of England and Wales, fairly typical of an advanced industrial community. Here the base is contracted. The pyramid becomes barrel shaped in the middle-age groups, and the tapering about these is very gradual. In contrast with India, this pyramid is of a mature society—even the diagram has a middle-age spread. Only 33 per cent males and 27.6 per cent females are under 20, but 14 per cent and 19 per cent respectively are over 60 years of age (Fig. 33).

The demographic structure of the developed and the developing countries differ appreciably and affect the relationship between society, land and resources. The developed countries have mature populations with many in the older age groups. Agricultural and developing countries are young, with a preponderance of children. In the former a low death rate will ensure that most

of the young will eventually fill the older age groups, in the latter the higher death rates thin out the ranks very rapidly. In this way structures vary and so do the lives of the people, for different age groups have different demands and different contributions to make, and this substantially alters the total interactions of society and land and ultimately the standard of living of the population. The size of population depends mainly on the relation between the birth-rate and the death-rate. As this relation differs greatly between people, there is a large number of demographic types. The survival or lack of survival is thus a basic consideration in the working force structure of a society. This may be shown best by a comparison of survival rate in different age groups in two contrasting societies India and New Zealand

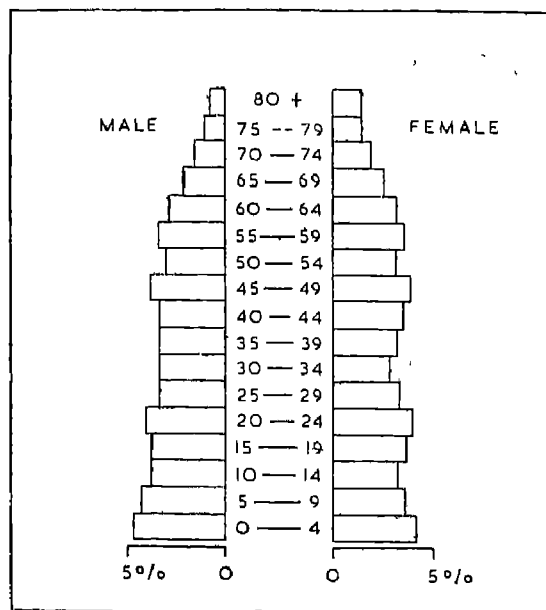


Fig. 33

TABLE VI

<i>At age</i>	<i>Survival per 100,000</i>	
	<i>India</i>	<i>New Zealand</i>
5	60,161	95,212
10	54,567	94,576
15	54,112	94,069
20	51,203	93,217
30	43,931	91,084
40	34,563	88,368
50	24,348	83,328
60	14,933	73,472
70	7,036	54,184
Average		
working life 30		40

In India at the age of 15, only 54,112 have survived of each 100,000 children born, while in New Zealand 94,069 have survived. The effective labour force is thus potentially much greater in New Zealand. This illustrates very high wastage of life in India, and the drain on both the family resources and on the community in general. 45,000 children in every 100,000 who will contribute nothing to the economy have to be cared for periods varying from a few days to 15 years. In other words, to produce the same labour force as New Zealand, India must provide twice the number of babies and care for them during their childhood. This is costly in food and resources, yet it is fairly typical of peasant communities, where the family is an economic unit and where a sufficient number of children must be born to ensure constant labour force.

Apart from age, birth and death rates, immigration also considerably affects the demographic structure of a particular society. Migration affects the population structure of the receiving countries and that of the home countries of emigrants. For example, between 1850 and 1900 Ireland's population was reduced from 8 to 4 million people by migration, about 90 per cent of which had

migrated to the U.S.A. Many young people left and the birth rate was drastically reduced.

The sex structure of the population is also important. The proportion of men and women affects the rate of population growth i.e. the next reproduction ratio, which measures the rate at which the present generation of women is replaced by daughters who will in turn have children. The calculation of this ratio allows forecast of future population trends to be made. The numbers of men and women are usually fairly even but sometimes out of balance after such events as wars, when more men than women are killed. The numbers are usually uneven in many countries in the higher age groups because women tend to live longer than men.

#### *Urban and Rural Population*

Population of a country can be divided into rural and urban categories. Without going into the details and definition of 'rural' and 'urban', as applied to the population, it may be said that until quite recently the vast majority of people in all lands were rural. Moreover, practically all rural people lived in small villages from which the farmers, who constituted perhaps 90 per cent or more of all villagers, went out to till their lands. The small towns of that period had comparatively little direct influence on the lives of the peasants who constituted 80-85 per cent of the total population. For well over a century a trend towards urbanisation has characterised the major nations of the world. This growth has been a natural accompaniment of commerce, trade and manufacturing. It has led to the aggregation of millions of people in small areas and, consequently, to new type of social experience for the masses. Developing countries with agrarian economies consist mainly of rural population, while in developed and industrial

countries most of the people live in urban settlements.

The urban and rural populations have their own way of life, characterised by different sets of problems. For example, as towns expand, the pressure of transport, water supplies, sewage and refuse disposal grows and creates problems. Smoke and chemical effluents from factories cause pollution of air and water. Tension created by urban life leads to a higher level of mental illness than in underdeveloped countries. Urban sprawl is another problem and thus reduces self-sufficiency in many countries. On the other hand towns provide amenities such as shops, entertainment and better social services, which cannot be matched in country districts. Employment is usually easier to find in urban areas. For this reason there is steady movement of people from the country to the towns. In some areas due to this movement farms are abandoned. The fewer people live in the country, the less economic it is to provide services and the greater becomes the disparity between town and country. Where rural depopulation is accompanied by mechanisation and rationalisation of farming and thus a rise in income, an improvement may result, but often the country districts suffer a decline in living standards. Ours is an old agricultural country as far as the rural-urban structure of India is concerned. Nearly 80 per cent of India's total population lives in villages. Each village is a cluster of shabby houses which are made of mud walls and bamboo. Very little attention is paid to sanitation in and around the village. The wells from which drinking water is drawn, are generally shallow, open and not far away from sewage spots. Their water is invariably contaminated and may cause stomach and other diseases.

In India only 20 per cent of the

total population lives in towns and cities. This slow growth of urbanisation is mainly due to the fact that India's industrial development has been very slow in the past. The towns are centres of administration, commerce, industry and education. Most of the towns in the past developed on account of their strategic position, and commercial, religious and administrative functions. With industrial progress, new manufacturing towns are cropping up and the existing ones are enlarging their limits. Lack of civic amenities, poor employment and poor educational facilities in villages are encouraging more and more people to settle in urban centres. In brief, the sizes of Indian towns after independence are expanding at an appreciable rate and the rural-urban structure of the Indian population is likely to be changed.

*Occupational Structure* : Population structure is studied in terms of occupation. Men earn a living by finding employment in some service, industry or in a profession. These services, industries, and professions are the occupations of mankind. Each occupation presents a line of human work. In producing the essential, consumes and luxury goods men make large use of soil, minerals, and other natural resources.

The occupations by which people earn a living may be classified into ten groups i.e., hunting, fishing, mining, lumbering, grazing, agriculture, manufacturing, transportation, trade and administration. In industrial societies like Britain, France, Germany, the U.S.A. and the Netherlands the major occupation of the people is trade, commerce and industries, while in developing and agrarian societies like those of African countries, India, China, Pakistan, Burma, Bangladesh, and Thailand, etc., people mostly depend on cultivation of crops, fishing, hunting, grazing and lumbering, etc.

India is essentially an agrarian country in which about 80 per cent of the total population, directly or indirectly depends on agriculture. India at present is, however, gradually increasing employment opportunities for the people in various fields i.e., manufacturing, mining, constructions, transportation and education. It is, therefore, likely that the pattern of occupational structure in India may undergo a perceptible change resulting in an increase in the number of workers in manufacturing, mining, construction, transportation and education and a fall in agricultural occupation.

The age, sex, occupation, urban-rural and literacy structures of different societies reveal that the population of any country is more than just the number of people, it is a distinctive group, a society, with its own structure, its own way of life, its own problems of waste and inefficiency, and its peculiar burdens of the very young and very old. These factors must be appreciated by a geographer. Though to sum up these complex conditions and classify 'quality' is difficult.

#### *Optimum Population*

The size, distribution and structure of the population within a country must be viewed in relation to its natural resources and techniques of production used by its people. The extent to which natural resources are used and the way in which they are used determine whether an area is underpopulated or overpopulated. A country is said to have optimum population when the number of people and the available resources balance. Optimum conditions can only be maintained if the exploitation of new resources or the development of new forms of employment keeps pace with increase in population. Up to a certain point an increase in number of people working on the land leads to a marked increase in

production. Once the optimum population has been reached, however, a further increase may increase production but at a decreasing rate so that output per capita declines. As more people become dependent on the same resource base each individual will become poorer.

On the other hand if there are not enough people to develop all the resources of an area its standard of living may remain lower than it could be, were its full potential realised. Thus Australia with less than four people per square mile, may be considered underpopulated today. Yet, before it was colonised by Europeans, it may not have been underpopulated even though there were fewer people, because the range of resources utilised by the aboriginal population was also far smaller than the resource-base exploited today. Similarly, in terms of the present day technology, Central Asia is considered underpopulated. There are vast mineral resources which could support industrial development and the government of the U.S.S.R. is encouraging migration to this sparsely populated region. But in the past Central Asia was inhabited only by pastoralists who knew nothing of modern technology. The resources which they were capable of exploiting were often overstrained, so much that waves of Central Asian peoples invaded surrounding areas in search of land and invaded India, China and Europe. Underpopulation or overpopulation, therefore, should be analysed in terms of the stage of development of the country concerned.

#### **Impact of Rapid Population Growth on Development**

The rapid growth of population led to many socio-economic problems in the developed and the developing countries. In the countries where population increase is high, a large proportion of young people (children below 15 years) in the

population remain dependent on the relatively small working section of the population. At the same time the large number of young people put extra strain on social services, especially education.

In many underdeveloped countries rapid increase in population leads to unemployment. From the overpopulated rural areas people migrate to the towns where it is often even more difficult to find work. Moreover, towns become overcrowded, making living conditions poor.

The standard of living in overpopulated countries is low and housing conditions are often poor. Low standards of hygiene and nutrition lead to health problems such as malnutrition, and the spread of disease.

In countries having rapid increase of population, improvements in agricultural technology are difficult owing to the farmers traditional attitudes which are often slow to accept new ideas. Moreover, in such countries industrial development is also slow owing to shortage of local capital, skilled labour, and purchasing power of the poor population. Thus rapid growth of population has generally an adverse effect on the agricultural and industrial development of a country resulting in poor standards of living. In the underpopulated countries, a rapid increase in population however, may be helpful in developing its resources. But in the long run population explosion leads to poverty, and a poor standard of living.

### **Rural Urban Continuum**

A study of settlement has great relevance to human geography as the shape and pattern in any particular region reflect man's relationship with the environment. Settlements have gradually grown up and evolved over a long period of time and by studying the site, pattern and arrangement of settlements we can see something of the history

of man's utilisation of the surrounding land. Moreover, settlements reflect the cultural, religious and social customs of his society. Some buildings in a town or village such as a temple, mosque, church, gurudwara and community hall are always reserved for public use. The type and number of such buildings help to give the settlement their distinctiveness.

Settlements are generally classified into the rural and urban categories. The basic difference between the rural and urban settlements is that in urban settlements the chief occupations of the people are industry, trade, commerce or administration, while in villages most of the people are engaged in agricultural work. Some other occupations e.g., fishing, lumbering, mining or herding are also found in villages, but in such villages there is a lack of commercial or shopping centres and industries.

### *Urban Settlements*

Urban settlements have been defined on the basis of population, size and functions. In an urban settlement the occupation of the people is generally, other than farming, fishing and lumbering. In Urban settlements industry, trade and administration are the main occupations. An urban settlement is thus a form of dwelling place in which the majority of its residents carry out their work within the built up area. It is also a compact dwelling place with a varied occupational structure which omits all the primary occupations, in agriculture particularly.

Cities are always located at the focus of highways. This may be : (1) where roads converge at a stream crossing, a mountain pass, the head of a large lake, or of navigation on a river, (2) at a junction of river highways or at the mouth of a stream, where coastwise and river-borne trade meet at a common point, (3) at the convergence of

important routes where harbour facilities are adequate to accommodate ocean borne trade and the site permits building a new city; and (4) at a focus of important rail routes. Such locations afford ease of access to raw materials and markets and commonly to sources of power as well. They are likewise transshipment centres, where bulk breakage occurs i.e., freight arriving in bulk is divided into smaller lots for distribution.

### *Functions of Towns*

On the basis of functions, towns are classified into different categories e.g., administrative, industrial, cultural, defence and religious centres.

1. *Administrative Towns* : Administrative towns include capital cities of nations, provinces, districts and other administrative units. London, Islamabad, Ottawa, Canberra, Delhi and Chandigarh are some of the examples of administrative towns. Administrative towns are concerned mainly with public administration and contain many public buildings, universities, offices, head offices of banks, post offices and railways. These towns house civil-servants and other office workers. In the newly constructed capitals more emphasis is on the pleasant surroundings. In some capitals e.g., Delhi and London trade and industry are also well established.

2. *Defensive Towns* : Most countries maintain armies, navies, and air forces for the defence of the country. Such towns, generally have barracks and training facilities for the armed forces. Many of the defensive towns are important for sports. Plymouth, Halifax, Jullundur, Jodhpur and Jammu are some examples of such towns.

3. *Cultural Centres* : Many towns have cultural functions such as the provisions for education, art galleries or religious buildings.

(a) In the educational towns apart from

university and college buildings, playgrounds, libraries, hostels and shopping centres are the major constructions. The university is sometimes mingled with the town (e.g., Aligarh and Roorkee), but the new educational cities are generally on the outskirts of the town. Cambridge, Oxford, Harvard, Heidelberg, Leiden (Netherlands), Shantiniketan and Pantnagar are educational towns.

(b) Entertainment functions are found in most towns, particularly in capitals, but some towns are noted for their theatres, e.g., Stratford in Avon, the birth place of William Shakespear for the cultural functions such as film making, Hollywood, California, Bombay and Poona.

(c) Religious centres are of several types. They may be the seats of religious leaders e.g., Rome, the residence of Pope, or Lhasa, once the seat of the Dalai Lama of Tibet. Religious centres may also be the centres of pilgrimage such as Jerusalem, Mecca, Banaras, Hardwar, Ajmer, etc. Religious towns have many religious buildings and shops selling religious books and pictures, etc. They also provide accommodation for pilgrims and are often tourist centres.

4. *Collection Centres*. Mining Towns, fishing ports and lumbering centres are included in collection centres. In these urban centres raw materials are collected and may be partly refined before sending them to factories and mills.

(a) *Mining Towns* : Mining towns may be based on precious metals like gold or silver, or industrial metals such as iron, copper, tin bauxite or zinc, power minerals e.g., coal, oil and natural gas. The towns which serve these mines may be small settlements, serving a particular mine, e.g., Johannesburg, Kalgoorlie, Coolgardie, Kolar, Raniganj and Jharia.

(b) *Fishing Ports* : Fishing ports are also collecting centres and specialise accordingly.

Such ports have facilities for landing, storing, cleaning, drying, packing and dispatching the fish, as well as canneries, fertilizers plants or freezing plants in some cases. Halifax (Newfoundland), Nova Scotia, Reykjavik, Aberdeen, Calicut, Cochin and Pondicherry are some of the important examples of fishing towns.

(c) *Lumbering Towns* : Towns in lumbering areas are collecting centres for logs, which may be brought in by railway, lorry or may be floated down-river to the town. Their functions are to collect and partly process the wood. They often have many saw mills. Some may also have plants for making pulp and paper. In Canada, Grand Falls and Corner Brooks are timber towns. In India Nepanagar, Kathgodam, Haldwani, etc. are lumbering towns.

5. *Production Centres* : Production centres are those towns where some kind of manufacturing industry is the major function. The type of industry carried on in the town may well affect its appearance, size and layout. For example, towns like Pittsburgh and Jamshedpur, making iron and steel will be dominated by large steel works, while a town which specialises in electric goods or cotton goods may have neat and clean factories. Production towns consist of labour houses, warehouses, godowns, banks and trading centres. For these towns apart from raw materials, transport for the raw materials and the finished goods is very important. In India, Jamshedpur, Bhilai, Rourkela, Ahmedabad, Baroda, and Surat are some of the important production centres.

6. *Transfer and Distribution Centres* : Several types of towns e.g., market towns, ports, and financial towns are included in transfer centres.

(i) *Market Towns* : Market towns are dominated by traders having a wide range of shops and stores. Moreover, market towns have banks, offices and sometimes a stock exchange. In addition market towns usually have a number of banks, insurance companies and other financial organisations. Hapur, Moga, Muzaffarnagar, Meerut, and Chandausi can be called the market towns of Northern India.

(ii) *Ports* : Ports are the most important trading and distribution centres. Some of the cities of the world, e.g., Tokyo, New York, London, Calcutta, Singapore, Hong Kong and Bombay are seaports. Seaports are characterised by port facilities, docks, harbours, warehouses, processing and transport facilities.

(iii) *Financial Towns* : In some towns the major function is finance rather than trade or distribution of goods. Frankfurt in Germany, Zurich in Switzerland, Amsterdam in the Netherlands and Beirut in Lebanon are examples of such towns. These towns and cities have stock markets, auction rooms, financial houses, banks, commercial, and travel agencies.

7. *Resorts* : Resorts are those towns which cater for the recreation needs of people in the surrounding areas or countries. They may be based on health-giving waters, seaside recreation, mountain climbing or skiing or an attractive scenery. The resort towns have hotels, sporting facilities, swimming pools, ski-training schools, theatres, cinemas, night clubs and children's playgrounds shopping facilities to buy souvenirs, postcards, etc.

8. *Residential Towns* : In some towns the chief function is simply to house a concentration of population. In such towns the

vast majority of the urban area will be occupied by houses and gardens and the commercial section may be rather small in comparison. The towns which fall into this category include suburbs and small towns or villages on the outskirts of large cities such as Faridabad, Sonapat, Ghaziabad, and Narela around Delhi. In addition to the above-mentioned towns, in some of the cities a large number of activities are also important. London, New York, Paris, Tokyo and Delhi are the cities which have diversified functions, and, therefore, they cannot be put in a definite class. Such towns are referred to as diversified in function.

### Urban Hierarchy

Hierarchy is the steplike differentiation implied by the terms hamlet, village, town, city, and metropolis. In the following lines a brief description of these urban hierarchical terms has been made.

#### *Hamlet*

A settlement of fewer than 100 people usually, has the smallest number of services probably fewer than ten. There might be a general store, a tea/coffee house. But you will not find a post office, a church, a mosque or a temple, or a grocery. For the more specialised services you will have to go to an urban village. In an urban village of the U S A, you could expect perhaps 60 or 70 establishments including a complex of gas stations, a restaurant and one or two bars, a farm elevator, two groceries. Obviously such a village would draw customers from a much wider area than the hamlet. In fact, people from a hamlet have to go to the village for some services.

A town of about 2,500 inhabitants has a still greater variety of functions and services. In towns we find a greater degree of specialisa-

tion and people will go to look for a doctor, dentist, drycleaner, various particular stores (hardware, furniture), a bank. Since such services are not available in either the hamlets or urban villages, the towns have greater service areas. Thus, rather than merely counting heads, we might define a town as a place where a certain assemblage of services is available and whose hinterland includes the service areas of the hamlets and urban villages.

The hierarchy can be carried further to include cities, the metropolis and still larger conurbations. The advantage is that we do not rank settlements merely according to their population, but rather reflect their strength as places of trade and commerce.

#### *Structure of Cities*

Cities are not simply disorganised, random accumulation of buildings and people; rather they have functional structures. They are spatially organised to perform their functions as places of exchange, production, education and residence, etc. There are certain forces that govern the distribution of central places on the landscape. One such force is the price of land, which is highest in the central city and tends to decline outwards. So you would not look for a spacious residential area near the heart of the city or for the down-town area on a town periphery.

Just by using these terms, residential area, down-town, we reveal our awareness of the existence of a regional structure in cities. When you refer to down-town, or to the suburbs, or to the municipal zone, you are, in fact, referring to urban regions, where certain functions are predominantly performed (retailing, residing, recreation in the three cases just mentioned). All these urban regions, or zones, of course, lie adjacent to one another and together make up the total city. But

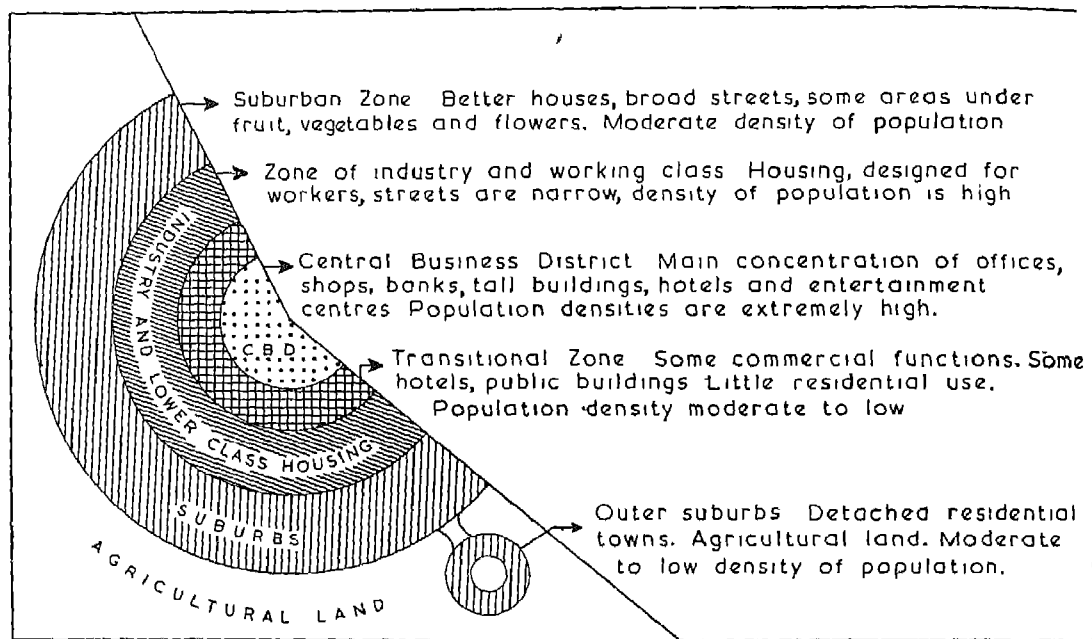


Fig. 34

how are they arranged? Is there any regularity, any recurrent pattern of the various zones of the city? In other words, do the city's regions constitute the elements of an urban structure that can be recognised to exist in every urban centre?

A study of layout of a large number of cities reveals that cities have central zones, consisting mainly of the Central Business District, and outer zones, where sprawling suburbs and shopping centres lie (Fig. 34). Between the inner and outer zones lie the middle zone, an ill-defined area, where change is frequently evident. This suggests that cities have a certain concentricity in their structure. Prof E.W. Burges, recognised five concentric zones, counting the innermost zone, the Central Business District (C.B.D.). The Central Business District, the heart of the city, has shops, offices, banks, theatres and hotels. It has multi-storey skyscrapers.

Transport lines, converge on the zone (Fig. 34). Surrounding the Central Business District, lies a transitional area, a zone of residential deterioration, marked also by the encroachment of business and light manufacturing. This is a zone of urban plight, of tenements and slums and inadequate services. Still farthest from the Central Business District lies the 'Zone of Working Men's Houses' a ring of closely built but adequate residences of the urban labour force (zone 3).

Zone No. 4 consists of middle class residence, a suburban area that is characterised by greater affluence and spaciousness. At this distance from the Central Business District of the city, local business district (shopping centres) make their appearance.

Zone No. 5 is the 'Urban Fringe' consisting of communities that are in effect dormitories of the Central Business District, where most of the economically active resi-

dents go to work. Here lie some of the highest quality residential areas. Here too, is the interdigitation of urban and rural areas, the leading edge of the advancing city. Small rural towns may be engulfed by the rising tide of urbanisation.

These zones are, however, not static, but are mobile and encroach on each other. As the city grows the whole system expands outward.

As the city expands the problems of safe drinking water, transportation, disposal of household waste, slums, air, and water pollution and noise become serious and adversely affect the health and efficiency of the inhabitants. In order to overcome these problems heavy taxation is made which makes urban life more expensive and full of tension.

### *Rural Settlements*

A rural settlement is the residing place of people who directly or indirectly depend on land. A rural settlement thus in fact is an agricultural workshop and it cannot be separated from the land whose use it ensures. Its shape and arrangements are often in strict accord with the kind of work done, the agricultural techniques and the way the soil is used. In the growth and development of rural settlements, water supply, elevated land, dry points free from floods, availability of building materials and defensive positions play vital parts.

### *Rural Settlement Types*

Type of settlement is the relationship of one dwelling to another, sometimes irrespective of site. Rural settlements are generally of two types, (i) Compact settlements, and (ii) Dispersed settlements.

*Compact Settlements*: The compact settlements develop, generally in the fertile plains and valleys where the land is productive

enough to support a large size of population. Such settlements develop around a nucleus and expand outward. The houses are compact and congested, having narrow lanes. The size of compact settlements depends on the nature and resources of the surrounding country. When the land resources are poor and scanty, the villages are small. For example, on the desert borders a compact settlement consists of only six or seven huts. On the other hand, the highly fertile lands have given rise to large-size compact settlements, their populations ranging from five to ten thousands. In the Great Plains of India, compact rural settlements are fairly large in number. In compact settlements the people are able to protect themselves from wild beasts and cooperate in tilling the soil. At the time of sowing and harvesting of crops they assist each other to finish the operations in time. Moreover, at the times of flood or any other natural calamity they can protect themselves in a better way. Such settlements, however, have their demerits as well. Being congested, compact settlements are generally dirty and the drainage is not adequately developed, and this affects the health and efficiency of the dwellers adversely.

*Dispersed Settlement*: These are usually found in areas where it is essential or at least desirable that the farmer should live on his own land rather than in a distant village centre. This is often true in high-land areas where livestock rearing is the main occupation, and common where farm sizes are large and population is rather sparse and scattered. For example in underpopulated areas such as in Central Australia, Northern Canada or Western U.S.A. Such areas often have difficulties of climate or land quality which means that farms must be large. Some areas of scattered settlement,

however, have rich farmland and a good climate. In such fertile tracts the scattered pattern is explained by socio-economic and historical factors.

Dispersed settlements are not restricted to the developed countries. Examples of dispersed settlements are found in Asian and African countries also. In Africa, notably in the South and East of the continent, settlements of Europeans on large farms and ranches have created some dispersed settlement.

Overpopulation is also one of the reasons for dispersed settlements. If part of the population left a village to found a new settlement they often founded dispersed settlements rather than new villages. Similarly when people moved into hitherto marshy land, or moved into marginal upland farms they usually built isolated farms rather than nucleated settlements.

There are striking differences between the compact and dispersed settlements. Almost everywhere in the world, nucleated settlements are more common than dispersed.

There are several reasons for this. In the first place men tend to dislike solitude and thus gather together. Often people in a village share tools or other equipments and in some cases work the land in common so that it is most convenient to live together in close proximity. The need of defence against animals or people also encourages a nucleated settlement for such dangers are more easily withstood by groups than by single families. Finally many villages were established where forests or other vegetation had to be cleared. Such clearings were originally small and the village had to be compact. As more and more land was cleared, however, the village would not have grown in proportion but would have remained relatively small in area. Thus men have built up compact settlements from the earliest time.

### *Patterns of Rural Settlements*

The patterns or designs of rural settlements show a great variety. Their designs differ from place to place and from region to region. Rural settlement patterns, however, can be classified into the following main categories.

- 1 The rectangular pattern.
- 2 The linear pattern.
- 3 The triangular pattern.
- 4 The starlike pattern.
- 5 The circular pattern.

The various patterns of rural settlements have been illustrated in Figs. 35 to 39. The

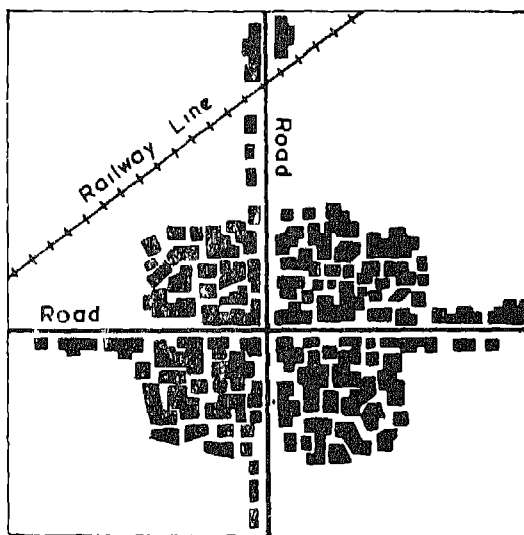


Fig. 35

most common type of rural settlement pattern is the rectangular in which the lanes are almost straight, meeting each other at right angles. Villages in the Great Plains of India, especially those which developed as a result of crossroads fall into this category (Fig. 35). In the linear settlements, houses are arranged along either side of a road, railway track along a river bank or levee, along the edge of a valley above flood-level or along the sea coast (Figs. 36 and 37).

Triangular patterns of rural settlements

mostly develop at the confluence of two rivers. At such locations the lateral expansion of the village is restricted by the rivers and there-

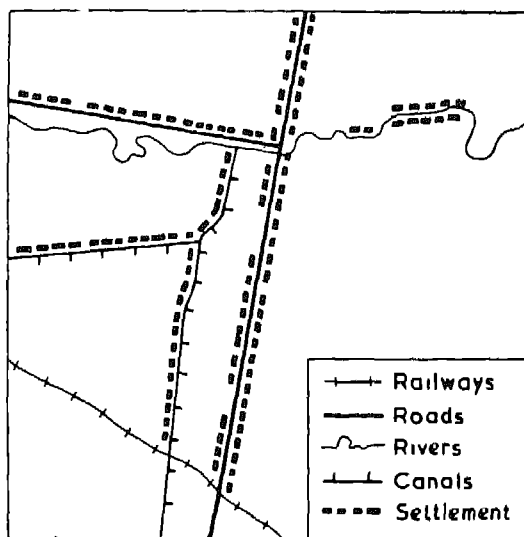


Fig. 36

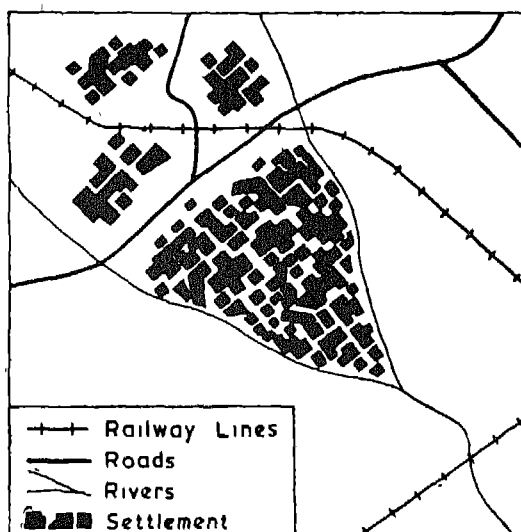


Fig. 38

fore, from the confluence point the village develops on the land lying in between the two rivers (Fig. 38).

In the star-shaped pattern, houses spread out in several directions. This pattern in

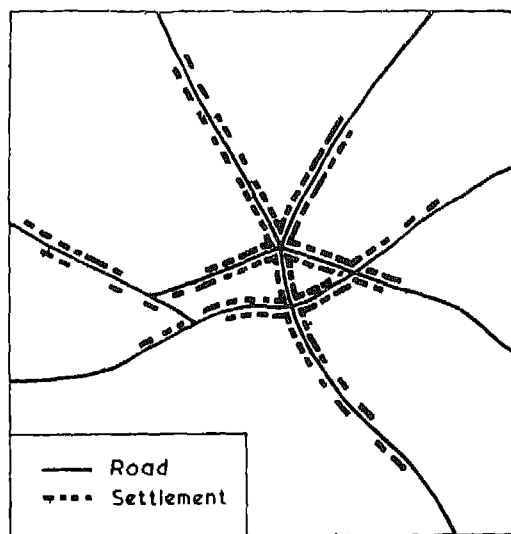


Fig. 37

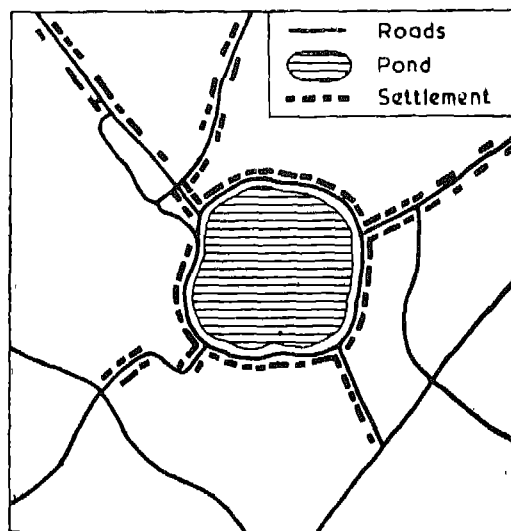


Fig. 39

common to both villages and towns and is caused by new developments spreading out along the major roads (Fig. 39)

The circular patterns of rural settlements develop around ponds, lakes and crater

filled with water. In the initial stage such patterns have a semi-circular shape but finally the houses expand around the water-body and take the shape of a circular pattern (Fig. 39)

### *Functions of Rural Settlements*

The functions of most rural settlements are agricultural. The isolated settlements are usually farms while the main functions of villages are to house the rural population. Moreover, the village is often a minor shopping centre with one or two shops and perhaps

a post office and it is also a social centre. Many villages also have some administrative function. Elected village Panchayats have some administrative functions though these are usually on a minor scale. In the fishing villages, sited along rivers, lakes, or coasts, the main occupation of the people is fishing, while in some villages lumbering is the main occupation. Fishing and lumbering villages are like agricultural settlements in having a few shops and some small scale administrative functions.

## EXERCISES

### **Review Questions**

1. Define and distinguish between rural and urban settlements.
2. Give a functional classification of towns.
3. Why are towns constantly growing both in population and in area ? What are the major problems caused by urban growth ?
4. Differentiate between the types and patterns of rural settlements. Give the merits and demerits of compact and scattered settlements.
5. Why are the arid, frigid, humid and mountainous parts of the world sparsely populated ?
6. Why are Monsoon Asia and North West Europe the two most densely populated parts of the world ?
7. State the various factors affecting uneven distribution of population. Illustrate your answer with suitable examples.
8. Describe the population growth of the world with special reference to India.
9. Discuss the impact of rapid population growth on the economic development of a country.

### **Finding Out**

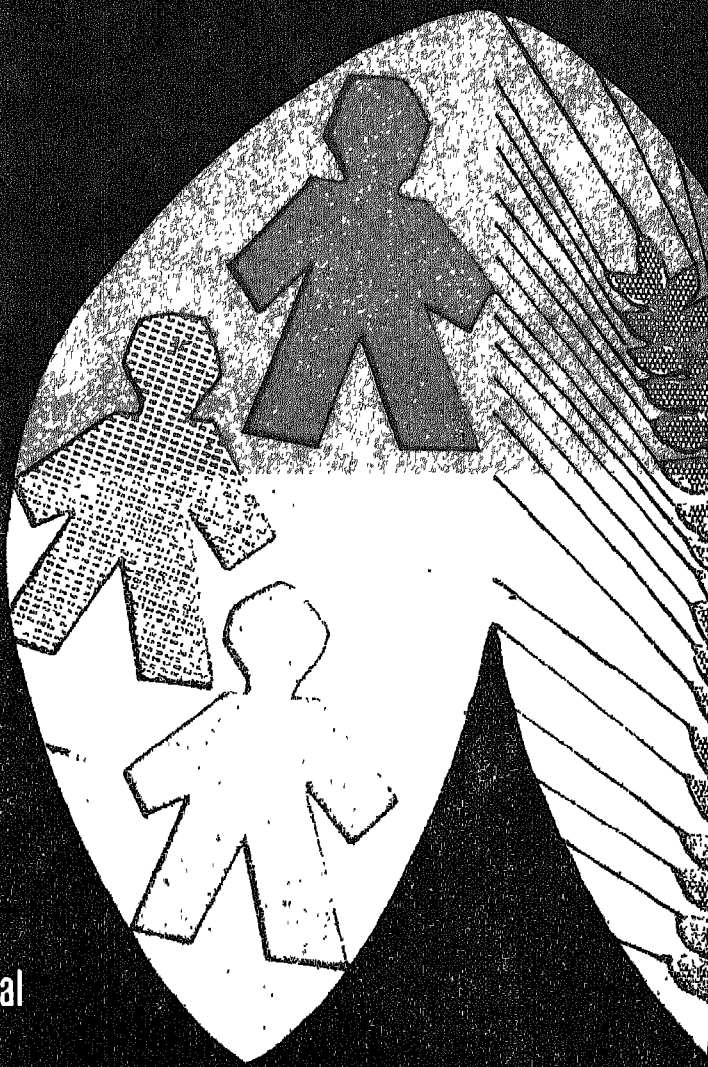
1. Find out the total population of each state of India as it was in the year 1971 and arrange your figures in an ascending order.
2. Find out the ten most thickly populated and the ten most sparsely populated of the countries world.

### **Cartographic Work**

1. In the outline map of the world show the densely and sparsely populated parts of the world.

## SUPPLEMENTARY READING

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